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AUTHOR Tobin, Catherine D.
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ABSTRACT

Presented are 10 activity-oriented units designed to provide an introduction to study skills in mathematics for pre-algebra students. Topic areas of the units include: listening as a study skill; problem solving; understanding the language of mathematics; learning from homework; using formulas; estimation; preparing for a test; and taking a mathematics test. By completing activities in the units, students learn about study skills needed for mathematics and practice those skills in a mathematics environment. Unit activities address a wide range of student needs, providing an introduction to specific skills for students who have little sense of a particular study skill, providing a learning experience of initial mastery for students who are ready to acquire a skill, and offering review and reinforcement for students who have mastered a given skill. Although the units are designed for pre-algebra students and have been found to be applicable in grades 7 to 9, they may be of value to students at other grade levels. In addition, it is strongly recommended that the units be taught within the context of an ongoing mathematics course rather than in separate settings. (JN)

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math study skills program

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MATH STUDY SKILLS PROGRAM

Developed by The Study Skills Group

Author: Catherine D. Tobin

Senior Editor: David Marshak
Bureau of Study Counsel
Harvard University

Editors: Kiyo Morimoto, *Director*
Bureau of Study Counsel
Harvard University

Jerome Pieh, *Headmaster*
Milton Academy

James J. McGuinn

National Council of Teachers of Mathematics
Reston, Virginia 22091

The National Association of Secondary School Principals
Reston, Virginia 22091

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INTRODUCTION

WHAT IS STUDY?

Studying means learning. Learning often involves listening, reading, watching, and writing. It always involves thinking.

You study more than you realize. You can study basketball or soccer, field hockey or track. And you can study clothes, dancing, and other people.

WHAT ARE STUDY SKILLS?

Study skills are ways or methods of learning. These skills can help you organize your learning so that you can learn better. Often study skills can save you time.

You probably use some study skills now. Can you think of any study skills that you already use?

STUDY SKILLS IN MATHEMATICS

How many people do you know who say "I can't do math . . ." or "I hate math . . ."? Most of these people really can do mathematics. Yet they've become afraid of it because they don't know how to learn mathematics.

When you learn math study skills, you find out how to learn math more effectively. For example, you can discover how to use your math book to study, how to solve problems, and how to find the meaning of a math term.

When you've developed study skills, you'll be able to make better use of your time and effort. You'll become an independent learner and problem solver. An independent learner knows which questions to ask and how to find the answers to those questions.

The Thm Math Study Skills Program

People learn study skills best when they practice them. Each unit in this book will help you learn about useful study skills and will give you a chance to practice these skills.

UNIT I: LISTENING IS A MATHEMATICAL SKILL

WHAT IS LISTENING?

Have you ever heard the words someone has spoken and then realized that you didn't know what that person had said? We all do this. It happens when we don't really listen.

Listening is more than just hearing. Listening means directing your attention to what you're hearing. It also means knowing what you've heard and trying to make sense of it.

Listening is a skill which we can learn. We're not born as good listeners. We need to learn how to listen well.

A good listener is an *active listener*. An active listener hears words as they are spoken and thinks about what they mean.

QUESTIONS FOR GOOD LISTENERS

Directions: Try to be an *active listener* as you listen to the questions that your teacher reads. Write your answer for each question on the line provided.

Hint: Most of the questions are riddles!

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____

BECOMING AN ACTIVE LISTENER

An *active listener* hears the words that are spoken and thinks about what the speaker is saying. An *active listener* always tries to make sense of what he or she is hearing.

Below are three helpful ways to think about what you are hearing.

1. While you listen, ask yourself questions about what the speaker is saying. These questions can help you make sense of the speaker's message.

   ASK YOURSELF: What is the speaker telling me? Is the speaker describing a procedure which I should follow? Is the speaker giving me directions? Is the speaker looking for information?

2. Try to connect what you are hearing with what you already know.

   ASK YOURSELF: How does what the speaker is saying fit into what I already know? What do I already know that connects with it?

3. Try to listen "between the lines." Listening "between the lines" means to figure out what the speaker is hinting at or saying indirectly. (Think about the riddles that you just heard. Could you listen "between the lines" of the riddles?)

   ASK YOURSELF: Is there anything that the speaker is hinting at but not saying directly? Are there any missing words that could change the meaning of what the speaker is saying?

EXERCISE 1

Directions: Your teacher will read several math problems aloud. Each problem cannot be solved because it lacks an important piece of information. As you listen to each problem, think about what is missing. Then, describe what's missing on the lines below.

Example

_____

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

LISTENING IS A MATHEMATICAL SKILL

Think about how much listening you need to do in your math class. For example, you listen when your teacher presents a new idea or problem and explains it. You listen when your classmates ask questions and answer problems. You listen when your teacher assigns homework, talks about a test, or gives a test back and goes over it.

You can see that listening is a very important skill in mathematics. You need to listen well to understand what's going on in class. In fact, the better you can listen, the better you'll be able to learn.

What other kinds of listening do you do in mathematics? Here are some examples:

1. When you answered the riddles, you used one kind of math listening. You listened to make sense of what was being said.
2. In Exercise I, you listened to discover what was missing from each of the word problems.
3. Another kind of math listening is hearing sentences in words and writing these sentences in mathematical symbols. You can think of this as translating from English to math symbols.

In the next exercise, you'll get a chance to practice hearing sentences in words and writing them in symbols.

EXERCISE II

Directions: Your teacher will read several sentences aloud. Listen carefully. Write each sentence in mathematical symbols on the lines below.

Example

_____

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

TIPS FOR GOOD LISTENERS

Here are a few more ways you can improve your listening skills. Think about how you would use these tips. Then, try them out to see how they work!

1. Look at the speaker as you listen. If possible, establish eye contact. This will help you pay better attention to what the speaker is saying.
2. Take notes when you need to remember what is being said. Write down any information, diagrams, and examples that will help you understand and recall.
3. If you have any questions about what the speaker is saying, write them down. Keep listening! Then, ask your questions when the speaker is ready to answer them.

LISTENING AND VISUALIZING

Another way to be an *active listener* is to visualize what the speaker is saying.

To visualize means to see "pictures" in your mind. Some people close their eyes to see "pictures." Other visualize with their eyes open.

When you're listening, you can often learn what the speaker is saying by making a "picture" in your mind. Ask yourself: can I "picture" what the speaker is talking about? If you can, then do it. (You only need to see the "picture" in your mind for a few seconds to learn from it.)

How do you visualize? You may already know how. Do you? If you don't know, try this: sit comfortably and close your eyes; take a few deep breaths; now, with your mind's voice, ask yourself to see a circle. Now, open your eyes. Did you see it?

EXERCISE III

Directions: Your teacher will read two problems aloud. If you can, make a "picture" in your mind for each problem. Draw your "pictures" in the spaces below. (You don't need to answer the problems.)

1.	2.

UNIT I SUMMARY: LISTENING IS A MATHEMATICAL SKILL

Listening is a skill. It takes effort and practice to learn how to be a good listener.

Listening is an important skill in mathematics. The better you can listen, the better you'll be able to learn in your math class.

A good listener is an *active listener*. An active listener hears words as they are spoken and thinks about what they mean.

How can you become an active listener?

1. Ask yourself questions about what the speaker is saying.
2. Try to connect what the speaker is saying with what you already know.
3. Try to listen "between the lines" for what the speaker is hinting at.
4. When you can, "picture" in your mind what the speaker is saying.
5. When you need to remember what the speaker is saying, take notes. Write down any information, diagrams, and examples which will help you remember.
6. Jot down any questions that you want to ask. Keep listening! Then, ask your questions when the speaker is ready to answer them.

In math class, a good listener can also:

1. Listen to a problem and make sense of it.
2. Translate spoken words into mathematical symbols.

UNIT II: PROBLEM SOLVING (1)

WHAT IS A PROBLEM?

A problem is really a question. To solve a problem, you need to find the question and figure out a way to answer it.

In a math problem, you usually receive some information with the question. It's up to you to (1) find the connection between the information and the question, and (2) figure out a plan for answering the question.

Look at the problem below. On the lines under the problem, describe how *you* would solve it. REMEMBER: You don't need to solve the problem and find an answer for it; just describe *how* you would solve it.

PROBLEM: How many parts does a piece of paper have when it has been folded in half ten times?

_____

_____

_____

_____

SOLVING PROBLEMS: HOW TO BEGIN

Problem solving is not a mystery. It's a way of thinking that you can learn.

The first step in solving any problem is figuring out what the problem is. If it's a written problem, read it carefully. Think about it, and then tell yourself exactly what the problem is.

Most problems are not solved just by reading the problem and then doing a calculation. Usually, you need to organize the information in a problem before you can solve it. For some problems, just organizing the information will give you the answer. For other problems, organizing the information will help you see what you need to do next.

One good way to organize information in a problem is to make a *table* or *chart*. In Exercise I, you'll get a chance to try this.

EXERCISE I

Directions: Solve problems 1-3 below. To help you solve them, use the tables given.

1. How many parts does a piece of paper have when it has been folded in half ten times? (Hint: Fold a piece of paper!)

Number of folds	Parts
1	2
2	
3	
4	
5	
6	
7	
8	
9	
10	

Do you see any patterns in your table? If you do, what are they?

_____

_____

_____

Think about the problem below, and answer it later:

How many parts will there be if the paper is folded 15 times? 100 times?

2. John was 5 years old when his father was 41 years old. How old will John be when his father is four times older than John?

John	5	6									
Father	41										

REMEMBER: Making a table is as good a way to solve a problem as any other way! When you can make a table for the problem, you organize the information and can often solve the problem.

3. Every day Peggy saved some money. She saved $1.00 the first day. Then, each day she saved $1.00 more than she had saved the previous day. What were her total savings at the end of 30 days?

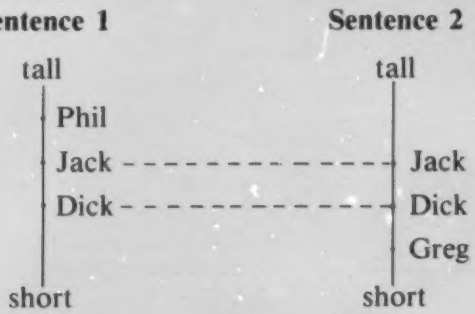
Day	1	2									
Saving	$1	$2									
Total	$1	$3									

MAKING A DIAGRAM

You can solve some kinds of problems by making a diagram. There is no one special way to construct your diagram. Draw it in a way that makes sense to you.

Look at the problem below to see how you can use a diagram to solve a problem.

Example: Jack is shorter than Phil but taller than Dick. Dick is shorter than Jack but taller than Greg. Which man is the tallest and which is the next to tallest?



Phil is the tallest. Jack is the next to tallest.

EXERCISE II

Directions: Solve problems 1–3 below. Draw a diagram to help you solve each problem.

1. Cathy, Maria, and Jennifer differ in height. Their last names are Martin, Sanchez, and Davis. Cathy is taller than Jennifer but shorter than Maria. Martin is the tallest of the three, and Davis is the shortest. What are Cathy's and Jennifer's last names?

   Draw your diagram here.

   Cathy's last name is _____.

   Jennifer's last name is _____.

2. The ace, king, queen, and jack of hearts are placed in a line on a table. In how many different ways can they be placed in a line?

   Draw your diagram here.

   What is the answer? _____

3. A train travels 30 miles in the time a car travels 20 miles. How far will the train have gone when the car has traveled 90 miles?

   Diagram your solution here.

   What is the answer? _____ 16

CREATING A SIMPLER PROBLEM

Sometimes a problem seems unsolvable when you first examine it. Two reasons why this might happen are these:

1. The numbers in the problem are very large.
2. Within the problem, there are hidden problems which need to be solved first.

When a problem seems unsolvable, try to find a simpler problem that is like the original one. Or make up a simpler problem. Solve that problem, and then use the new information to help you with the original problem. In Exercise III, you'll get a chance to try this approach.

EXERCISE III

Directions: Solve problems 1–3 below. Use the instructions within the problems to help you solve them.

1. A light at the airport blinks 3 times every 2 seconds. How often does it blink in one day?

   To solve this problem, ask a few simpler questions and answer them. First, how often does the light blink in one minute? Complete the table below to find the answer.

blinks											
seconds	1										60

   How often does the light blink in one hour? Complete the table below to find the answer.

blinks											
minutes	1										60

   Now you have enough information to solve the original problem. How often does the light blink in one day?

blinks											
hours	1										24

Continued on Page 12.

2. A group of 28 people may enter the Haunted House every 4 minutes. How long would you have to wait in line to enter if 580 people were ahead of you?

   Write a simpler question. Then, answer your question.

   Your question: _____

   _____

   _____

   Answer:

   Now, use your answer to help you solve the original problem. Write the solution below. Show how you found that solution.

3. A small car goes 12 km on a liter of gas. A station wagon goes only 7 km on a liter of gas. How many liters of gas can be saved by taking the small car rather than the station wagon on a trip of 420 km?

   What is the first problem you need to solve? Write that problem as a question.

   _____

   _____

   Write your solution to the first problem:

What is the second problem you need to solve? Write that problem as a question.

_____

_____

Write your solution to the second problem:

Now, solve the original problem. Show how you found the solution.

UNIT II SUMMARY: PROBLEM SOLVING (1)

Problem solving is a way of thinking that you can learn.

The first step in solving a problem is figuring out exactly what the question is. Read the problem carefully; then, tell yourself what the question is.

A second step in solving a problem is organizing the information in the problem. Sometimes when you organize the information in a problem, you'll find the solution. Two good ways to organize the information in a problem are:

1. Make a table or chart
2. Draw a diagram

When a problem seems unsolvable, try to find a simpler problem within the problem. Solve the simpler problem first. Then, use the new information to solve the original problem.

UNIT III: UNDERSTANDING THE LANGUAGE OF MATHEMATICS (1)

THE LANGUAGE OF MATHEMATICS

Every activity and subject has its own special language. When you work in a subject, you need to understand what the words of its language mean. For example, in music you find words like note, song, harmony, and scale. In baseball, there are words like hit, run, out, and steal. Each of these words has a special meaning in its particular subject or activity.

Mathematics has its own language, too. To understand mathematics, you need to know about the words in its language. The more you understand the language of mathematics, the more math will make sense to you.

On the line below, can you list three words from the language of mathematics that you already know?

USING YOUR RESOURCES

Imagine that it's after dinner now and you're starting to do your math homework. You open your book and begin to read the directions for your assignment. In the very first line, you discover a key word that you don't understand. How can you find out what it means?

There are skills that you can learn to help you solve a problem like this one. These study skills give you a way to use the resources around you, particularly the resources in your textbook. They can help you learn more about the language of mathematics. They can also help you answer other questions that come up when you are doing math.

In this unit, you'll begin to learn study skills for using your math resources. You'll also learn more about the language of mathematics.

SOURCES FOR MEANINGS

Now think about that key word from your math homework again. How can you find out what it means?

First, try using the resources in your textbook: the glossary
the index

Glossary

The *glossary* in a textbook is a lot like a dictionary for that book. It lists words and terms which are new or unfamiliar to most readers, and it tells you what their meanings are.

You can usually find the *glossary* at the end of the body of the book.

EXERCISE I

Directions: Put a check next to each word listed in the glossary of your math textbook. Time yourself!

Starting time _____

Venn diagram _____

integer _____

polynomial _____

least common denominator _____

symmetry _____

exponent _____

velocity _____

rational numbers _____

Finishing time _____

Index

An *index* lists important words and terms found within the book. The list is in alphabetical order. Numbers of pages where the words and terms can be found are listed after the words and terms.

Look up an unknown word or term in the index. Find out on what page you can read about it. Then, turn to that page in your book and read to see if you can figure out the meaning of the word or term.

You can usually find the *index* at the very back of the book.

EXERCISE II

Directions: Look up each word listed below in the index of your textbook. Write the page number(s) given for each word on the lines below.

Venn diagram _____ symmetry _____

integer _____ exponent _____

least common denominator _____ velocity _____

Other Sources For Meanings

Sometimes you can read the glossary's definition of a mathematical term and still not really know what it means. The same can happen when you look up a word in the index and then read about it in your book. When this happens, what else can you do?

One other resource is the *dictionary*. Look up the word and see if it's listed in your dictionary. If it is, the dictionary definition may help you to learn its meaning.

Another resource is *people*. Ask a friend, an older sister or brother, or a parent.

EXERCISE III

Directions: Put a check next to each word or term listed in your dictionary.

Venn diagram _____ exponent _____

polynomial _____ velocity _____

least common denominator _____ rational numbers _____

USING YOUR SOURCES FOR MEANINGS

How do you know when to use which source? All of these sources can be useful. To know when to use which one, you need to know how they are different. In the next exercise, you'll be able to compare the various sources for meanings.

EXERCISE IV

Directions: For each of the underlined words below, use all of your resources to find its meaning. Write the meanings you find on the lines below. Only include meanings that you would use in mathematics.

1. List all the *factors* for each number.

   glossary: _____

   _____

index and text: _____

_____

dictionary: _____

_____

people: _____

_____

2. What is the *perimeter* of the field?

glossary: _____

_____

index and text: _____

_____

dictionary: _____

_____

people: _____

_____

EXERCISE V

Directions: Choose which resource you want to use to find the meaning of each of the underlined words below. You may wish to use one resource for all of them, or to use several resources.

Write each meaning on the line next to the underlined word. Also, in parentheses, write the resource you used to find that meaning.

Example

terminating decimal: a decimal number that has a finite number of decimal places (Glossary)

1. variable: _____

_____

2. corresponding angles: _____

_____

3. composite number: _____

_____

4. factorial: _____

_____

EXAMPLES

Another aid to your understanding of a mathematical word or term is seeing an example of the word or term. When you can see the example and get a sense for how it works, it often helps you to understand the term better.

EXERCISE VI

Directions: Use your resources to find an example of each of the following terms. Write the examples that you find or make up in the spaces next to the terms.

Example

reciprocal: $\frac{2}{3} \times \frac{3}{2} = 1$ $\frac{3}{2}$ is the reciprocal of $\frac{2}{3}$

1. factor:

2. hypotenuse:

3. perimeter:

4. absolute value:

5. additive inverse:

6. convex figure:

24

UNIT III SUMMARY: UNDERSTANDING THE LANGUAGE OF MATHEMATICS (1)

Like any other activity or subject, mathematics has its own special language. The more you know about this language, the more you'll be able to make sense of mathematics.

There are many resources which you can use to help you learn more about the language of mathematics:

1. In your textbook: the glossary
   the index and text
   the table of contents
2. The dictionary
3. Ask a friend, older sister or brother, or a parent

Finding examples of mathematical terms and looking carefully at these examples can also help you understand what the terms mean.

Using your resources to help you learn the meanings of mathematical terms is one useful study skill. You can also use these resources to answer other questions that come up in math.

UNIT IV: UNDERSTANDING THE LANGUAGE OF MATHEMATICS (2)

INTRODUCTION

In this unit, you will learn about two other parts of the language of mathematics: "musical phrases" and mathematical symbols. You'll also practice a way to keep track of all the new words, phrases, and symbols that you learn in your math class.

MUSICAL PHRASES

Look at the phrase below:

LEAST COMMON DENOMINATOR

Say the phrase quickly to yourself. Now, say each word in the phrase slowly and carefully. What's the difference?

"Least common denominator" is an example of a "musical phrase" in mathematics. A "musical phrase" is a group of words which have some special meaning together. Often you lose the meaning of these phrases when you speak or read them. You say the "musical phrases" so quickly that you hear only their sound or "music," not each of their separate words. When you do not hear the words clearly, you have trouble knowing what the phrases mean.

Also, "musical phrases" are often called by their initials. For example: least common denominator is LCD. This use of initials can add to your confusion.

How can you make sense of "musical phrases?" Use the steps below.

1. When you find a new "musical phrase," say each word in the phrase separately. Think about the meaning of each separate word.
2. Think about the words in the phrase together and figure out the meaning of the whole phrase.
3. When you can't figure out the meaning of the phrase, look it up in your textbook or dictionary, or ask your teacher about it.

EXERCISE I

Directions: Read each "musical phrase" carefully. Then, using your own words, write the meaning of each phrase on the lines provided. Be sure to write a meaning that makes sense to you. (If you need help with any of the words, *use your math resources.*)

Example

LCD — least common denominator: Smallest denominator that is the same for all the fractions listed

1. GCF — greatest common factor: _____

2. LCM — least common multiple: _____

3. greatest possible error: _____

4. prime factorization: _____

5. perpendicular bisector: _____

6. Can you invent a "musical phrase" of your own? It can be real or imaginary. Write your phrase and its definition on the lines below.

MATHEMATICAL SYMBOLS

A mathematical symbol is a sign or marking which has a special meaning. For example, look at the two symbols in the arithmetic problem below:

$$2 + 3 = 5$$

The + is a symbol which means addition. The = is a symbol which means equals.

Think about the mathematical symbols that you already know. Which symbols come into your mind? List as many mathematical symbols as you can on the lines below.

_____

_____

FINDING THE MEANINGS OF MATHEMATICAL SYMBOLS

How can you find out the meaning of an unfamiliar mathematical symbol? The index won't help you; it's alphabetical. So is the glossary. However, most math textbooks include a list of symbols and their meanings in the back of the book.

EXERCISE II

Directions: Find the meaning of each symbol below. Write the meaning of each symbol on the line to the right of the symbol.

Example

$\perp$ is Perpendicular to

1. $|-3|$ _____
2. $\leq$ _____
3. $\sqrt{\ }$ _____
4. $\cong$ _____
5. $\cup$ _____
6. $m\angle ABC$ _____

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KEEPING TRACK OF THE LANGUAGE OF MATHEMATICS

One good way to learn new mathematical terms and symbols is to keep track of them in your notebook.

First, write down the term or symbol. Write its definition. Then, give an example of the term or symbol and, using your own words, tell yourself what it means. Look below to see an example of notes in this form.

Term	*Definition*	*Example*	*My description*
integers	the set consisting of the whole numbers and their opposites	6, −5	positive and negative numbers and zero

WHY TAKE NOTES IN MATH?

When you take the time to keep track of new terms and symbols, you'll know that you can always look them up in your notebook. Also, writing down the terms and symbols will help you to remember what they mean.

EXERCISE III

Directions: Fill in the notes below for the listed terms and symbols. You can use the example on page 23 as a model.

PLEASE NOTE: You may not need to list a definition, an example, and a description in your own words for every new term or symbol. Think about what *you* need to write down to help *you* understand the particular term or symbol. Then, decide how much information you need to include for that term or symbol.

TERM	DEFINITION	EXAMPLE	MY DESCRIPTION
1. altitude			
2. $\neq$			
3. range			
4. irrational numbers			

UNIT IV SUMMARY: UNDERSTANDING THE LANGUAGE OF MATHEMATICS (2)

Two special parts of the language of mathematics are "musical phrases" and mathematical symbols.

A "musical phrase" is a group of words which have a specific meaning together. An example of a "musical phrase" is "least common denominator." When you come across a "musical phrase," look at each word carefully. Then, put all the words together to figure out the meaning of the phrase.

A mathematical symbol is a sign or marking which has a special meaning. An example of a symbol is = which means equals.

A good way to keep track of new mathematical terms and symbols is to write them down in your notebook. Include the term or symbol, its definition, an example, and a description in your own words.

OVERVIEW: UNDERSTANDING THE LANGUAGE OF MATHEMATICS

When you come across a mathematical term that you don't understand, *look up its meaning* in:

1. The glossary of your textbook
2. The index and text of your textbook
3. The dictionary

Or you can *ask somebody else* about the term. Ask a friend, your teacher, or a member of your family.

When you find out what the term means, *write it down* in your notebook like this:

term	definition of the term	example of the term	description of the term in your own words

When you come across a mathematical symbol that you don't understand, look it up in the list of symbols at the back of your textbook. If you can't find the symbol there, ask your teacher about it.

UNIT V: PROBLEM SOLVING (2)

INTRODUCTION

In Unit II, you used three different strategies for solving problems in math:

making a table
drawing a diagram
writing simpler problems

This unit will help you to learn another good way of solving math problems: *using a graph*. You'll also learn more about *finding patterns* as a way to solve problems.

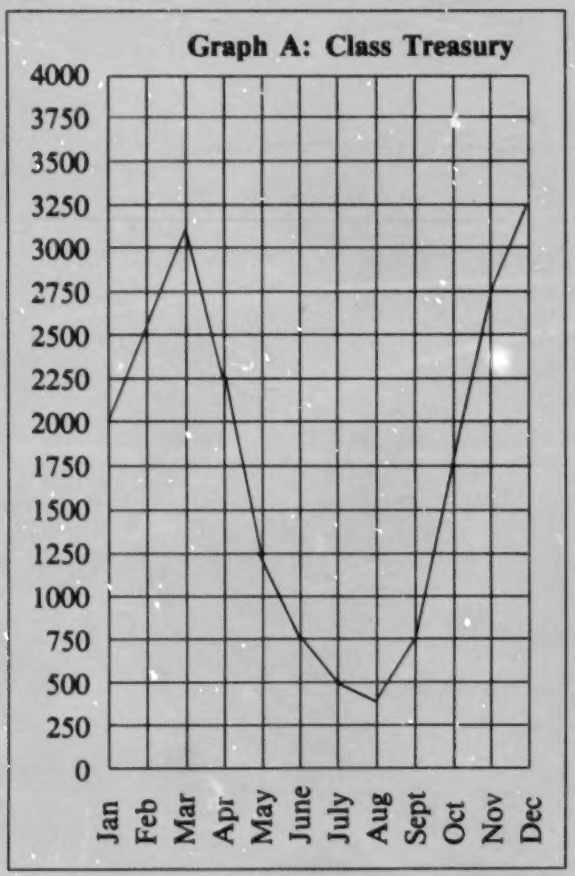
USING GRAPHS

Graphs are special kinds of pictures which are used to organize and show information. They are used to present a large amount of information in a small space.

Information in mathematics can be confusing when it is presented to you in long paragraphs. When you see the same information in a graph, it usually becomes much clearer.

EXERCISE I

Directions: Use graph A to answer the questions below. Then, turn to page 28 and use graph B to answer questions 6–9.



1. When did the class treasury contain the most money?

_____

2. When did the class treasury contain the least money?

_____

3. In which months did the treasury have approximately $750?

_____

4. By how much did the treasury increase between September and November?

_____

5. Between which two months was the greatest amount of money spent?

_____

Graph B: NEW HOME SALES

New single-family homes sold, in thousands

Homes sold (in thousands)	
Sept.	570
Oct.	545
Nov.	577

Source: US Commerce Dept.

6. About how many homes were sold in March?

_____

7. About 550,000 homes were sold in which two months?

_____

8. Real estate agents did their best business in which two months?

_____

9. About how many more homes were sold in October than in March?

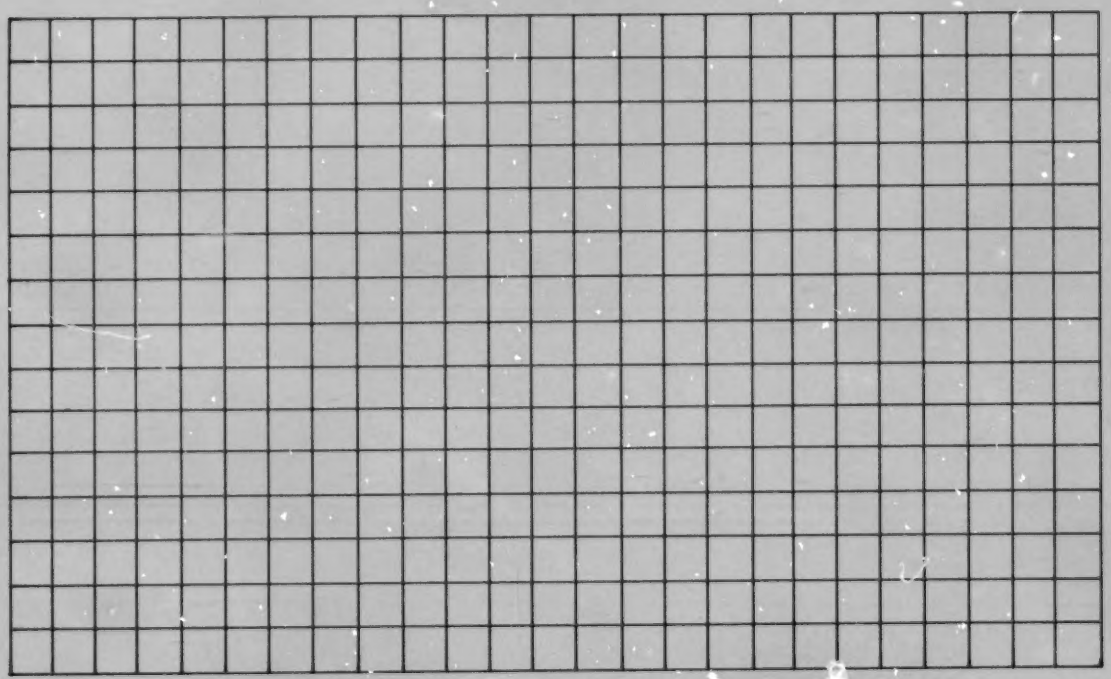
_____

EXERCISE II

Directions: Graph the tennis shoes sales figures listed below. Remember to write a title and labels. When you have completed the graph, use it to help you answer the questions on page 30.

Sports Tennis Shoes Sales (in dollars)

January	310,000	July	940,000
February	250,000	August	830,000
March	380,000	September	660,000
April	470,000	October	610,000
May	850,000	November	320,000
June	860,000	December	520,000



1. Which were the best months for sales? _____

2. Which were the three slowest months for sales?

_____

3. Which month showed the greatest increase in sales? _____

4. In which month would you increase your advertising? _____

5. When are graphs useful in solving problems? In what ways are they useful?

_____

_____

_____

_____

_____

_____

FINDING PATTERNS

One of the most useful strategies for solving problems is *finding patterns.* Look at the sequence of numbers below. Can you see the pattern?

1, 1, 2, 3, 5, 8, 13, ___.

If you put twenty one as the next number, you have found the pattern: each number is the sum of the two numbers which come before it. It takes practice to see meaningful patterns. With practice, you can become better and better at finding patterns in mathematics.

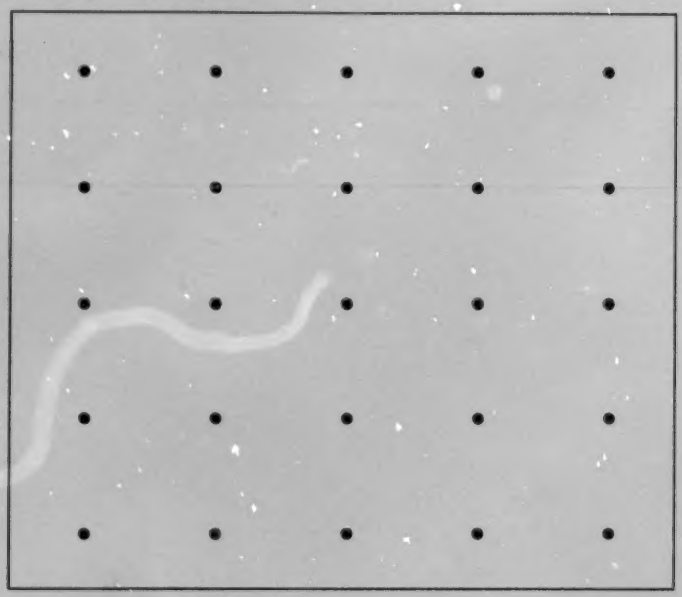
Try to solve the problems in Exercise III by finding patterns.

EXERCISE III

Directions: Fill in the tables and answer the questions for problems 1–3.

1. Imagine that this diagram is a geoboard. You have elastic bands to place around the nails. How many squares are there on a 4 × 4 geoboard?

   Hint: How many squares on a 1 × 1 geoboard? On a 2 × 2 geoboard? On a 3 × 3 geoboard?



Dimensions of Squares

Size of Geoboard	1 × 1	2 × 2	3 × 3	4 × 4	Total
1 × 1	1				
2 × 2	4				
3 × 3					
4 × 4					

HOW MANY OF EACH SQUARE?

What patterns do you see in the table?

_____

_____

How many squares are there on a 10 × 10 geoboard? How do you know?

_____

Continued on Page 32

2. On a map 3/4 inch represents 14 miles. What distance is represented by 24 inches?

inches	3/4	1½					
miles	14						

What is the pattern? _____

_____

3. One •, three △, and six ▲ are called *triangular numbers*. What is the tenth triangular number?

Triangular numbers

1st	1
2nd	3
3rd	6
4th	10
5th	
6th	
7th	
8th	
9th	
10th	

What pattern did you find?

_____

_____

_____

What is the fiftieth triangular number?

_____

38

DIFFERENT STRATEGIES FOR THE SAME PROBLEM

There is more than one way to solve most problems in mathematics.

When you start to work on a math problem, you probably use the first strategy that comes to mind. What would happen if you took another minute or two and thought of other strategies to use? You might find a way of solving the problem that's quicker and easier than the first one.

EXERCISE IV

Directions: Read the problem below carefully. Then, think of the strategies you could use to solve it. List these strategies on the lines below.

1. Nancy and Joe are the judges for a guessing contest. They have a large jar of coffee beans. Before the contest begins, they must find out the exact number of coffee beans in the jar. How can they do this?

2. Thirty-one wheels rolled by the driveway to the school in a ten minute period. How many tricycles and automobiles could that have been?

EXERCISE V

Directions: Make up a problem of your own which can be solved by using more than one strategy.

1. First, write your problem on the lines below.
2. Then, list at least two strategies which you can use to solve the problem on the numbered lines below.
3. Next, solve the problem! Show your work in the space below.

PROBLEM

_____

_____

_____

_____

STRATEGIES FOR SOLVING THE PROBLEM

1. _____

_____

2. _____

_____

SOLUTION

40

UNIT V SUMMARY: PROBLEM SOLVING (2)

Using a graph is a helpful strategy for solving problems in mathematics. Graphs show you a lot of information in a small space, and they can help you to understand that information.

Finding a pattern is another effective way to solve problems. Often you can make a table to help you find a pattern.

There are many correct ways to solve most problems in mathematics.

UNIT VI: LEARNING FROM YOUR HOMEWORK

DOING YOUR MATH HOMEWORK

Have you ever thought about *where* and *when* and *how* you do your math homework? Answer the questions below, and you'll learn more about the ways in which you do your math assignments.

1. When do you usually do your math assignments?

   _____

   _____

2. Describe the place where you usually do your math homework. Or, draw a sketch of it in the space below. When you are in this place, what do you see around you? What do you hear around you?

   Description: _____

   _____

   _____

   _____

   _____

   Sketch:

3. Where do you put your materials (pencils, paper, textbook, calculator, straight edge, etc.) when you are doing your math assignment?

   _____

   _____

4. How long do you usually work before you take a break?

   _____

WHY DO YOUR MATH HOMEWORK?

What's the purpose of homework in math class? Usually your teacher gives you an assignment to do at home so you can practice something you've started to learn in school. When you can do something by yourself, then you know that you've really learned it.

Doing your math homework regularly is the best way to make sure that you are really learning mathematics. You also need to do your homework to earn a good grade in your math class.

On page 1, you created a "picture" of how you are doing your math assignments now. This unit can help you in two ways:

1. The unit can help you discover what works well in the way you do your math homework now.
2. It can also show you new ways to make better use of the time and energy you put into doing your math homework.

HOMEWORK IS STUDYING

When you are doing your homework, you're studying. Studying means learning, and the purpose of homework is to help you learn.

When you are studying to be a musician, a basketball player, or a cook, you need the right *environment* for your learning. The *environment* is everything that surrounds you. For example, when you are learning to cook, you need to work in a kitchen.

When you are studying mathematics, you also need the right *study environment.* Your *study environment* is what surrounds you when you are learning.

EXERCISE I

Directions: Read both paragraphs below, and follow the directions in the second paragraph.

People learn in different ways. So, what is a good *study environment* for one person may be different from that of another person. However, there do seem to be some parts of a *study environment* that are helpful for most people.

On page 39, you'll find pictures of two different *study environments.* Look at both of them carefully and compare the conditions in the two environments. Then, on the lines below to the left, write down all of the conditions you see which would help you to learn. On the lines to the right, write down all of the conditions you see which would bother or distract you.

HELPFUL	**DISTRACTING**
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

TIPS FOR DOING YOUR MATH HOMEWORK

1. Before you leave school, ask yourself, "What do I need to take home so I can do my math homework?" Then, take whatever you need with you.

2. Gather all of your math materials together. Have them within reach when you start to do your math homework. Ask yourself, "Do I need my textbook? Pencil and paper? My notes? My calculator? A protractor? What else?"

3. For most people 25–45 minutes is the best length of time for studying before taking a break. Ask yourself, "How long can I really pay attention when I'm doing my math homework?" Experiment to find out. For example, if you can concentrate for 35 minutes, plan to work for that long. Then, do something active and enjoyable for 5–10 minutes before you start again.

4. When you do your math homework in school, try to find a study environment where you can concentrate on what you're doing.

Environment #1

Environment #2

DOING CHAPTER EXERCISES IN YOUR TEXTBOOK

Often your teacher will ask you to do *chapter exercises* for homework. Many students begin their homework before they really understand what they are trying to do. When students do this, they make a lot of mistakes.

You can solve this problem by doing your homework in an organized way. When you work on chapter exercises in an organized way, you can learn a lot more. You can also get your homework done correctly.

The steps below can help you organize the way you do chapter exercises.

1. First, read the section in your book which comes before the exercises. Be sure that you understand what the section is about. If you don't understand it, talk with someone who can help you with it.

2. When you find sample problems or questions in your reading, try them on your own. See if you get the same answers as the book shows.

3. Before you begin your homework problems from the chapter exercises, try a few of the odd numbered problems. Check your answers as you go. (You can usually find the answers to odd numbered problems in the back of your textbook.) Try problems from the beginning, middle, and end of the chapter exercises. The problems usually become more difficult as you go through the exercises.

4. Now, you understand how to do the exercises. Do your homework problems!

EXERCISE II

Directions: On page 42, you'll find a section from a math textbook much like your own. Imagine that your teacher has assigned problems 2, 4, 6, 12, 14, and 16 in the chapter exercises for homework.

Follow steps 1–3 on page 40 for doing this "homework." First, read the textbook section. Be sure to try the sample problems on your own. Then, do the odd numbered problems listed below.

Copy each problem. Then, solve it. Check your answers! (Answers at the bottom of page 44.)

1. _____

_____

7. _____

_____

_____

11. _____

_____

_____

_____

15. _____

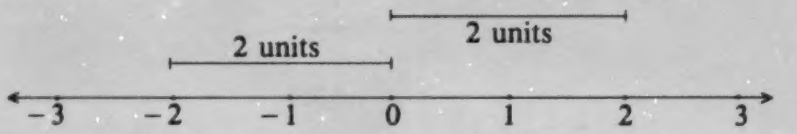
_____

_____

_____

ABSOLUTE VALUE

The absolute value of a real number is equal to the distance between the point for the number and the origin. The points for the numbers 2 and -2 are the same distance from the origin but in opposite directions.



The absolute value of 2 is 2, and the absolute value of -2 is 2.

We write: $|2| = 2$ Read: The absolute value of 2 is 2.

$|-2| = 2$ Read: The absolute value of -2 is 2.

Example 1

Find $|7|$ $|7| = 7$

Find $|-8|$ $|-8| = 8$

Example 2

Find $|-8 + 3|$ $|-8 + 3| = |-5|$
$= 5$

Find $|-3 + 7|$ $|-3 + 7| = |4|$
$= 4$

Example 3

Find $|4x - 1|$ if $x = -2$

$|4(-2) - 1| = |-8 - 1| = |-9| = 9$

EXERCISES

Find:

1. $|b - 4|$ if $b = 1$
2. $|x - 6|$ if $x = -2$
3. $|n + 5|$ if $n = -10$
4. $|4x - 2|$ if $x = 4$
5. $|5a + 3|$ if $a = -2$
6. $|3z - 8|$ if $z = 2$
7. $|10 - 3a|$ if $a = -20$
8. $|4 - 6x|$ if $x = 2$
9. $|7 + 4y|$ if $y = -3$
10. $|5b - 2|$ if $b = -6$
11. $|7 - 3a|$ if $a = 2$
12. $|6 - 3y|$ if $y = 6$
13. $\left|\frac{3b}{6} - \frac{1}{2}\right|$ if $b = 3$
14. $\left|\frac{3y - 1}{4} + \frac{y}{3}\right|$ if $y = -4$
15. $\left|\frac{6}{a^2 - 2} + \frac{4}{a - 3}\right|$ if $a = -1$
16. $\left|\frac{1}{x} - \frac{4a}{a^2 - 3a + 1}\right|$ if $a = -1$

EXERCISE III

Directions: If this were a real homework assignment, you'd be ready to do the problems now. And you'd know how to do them correctly.

Instead of doing the homework problems now, think about the three steps you've just used. (1) In the space below, write one way that you think using these steps can help you learn. (2) Is there anything that you dislike about using these three steps? If there is, describe it in the space below.

Help: _____

_____

Dislike: _____

_____

DOING REVIEW EXERCISES IN YOUR TEXTBOOK

Another kind of homework your teacher will assign is *review exercises.* These exercises are found at the end of each chapter in your textbook. They review concepts and ideas taught in the chapter.

Chapter exercises cover only the concept or idea taught on the few pages right before the exercises. *Review exercises* are different. They test how well you understand many different concepts. So, with review exercises, you have many more pages to look through to find out more about any problem that you don't understand.

How can you organize the way you do review exercises? Read the suggestions below.

1. When you know how to do a problem in the review exercises, go ahead and work the problem.

2. When you're not sure how to do the problem, try the steps below:

***Use the Table of Contents or the Index to find the pages on which this kind of problem is covered.

***Turn to those pages and read them. Try the sample problems that you find on those pages as you go along.

***Do a few of the odd numbered problems in the chapter exercises at the end of that section. Check your answers.

***Now that you understand this kind of problem, you can do the problem in the review exercises.

OR

***Talk with someone who understands how to do this kind of problem: a friend or a member of your family.

***Learn how to do this kind of problem. Then, do the problem in the review exercises by yourself.

Answers

1. 3	3. 5	5. 7	7. 70	9. 5	11. 1	13. 1	15. 7

EXERCISE IV

Directions: Using the Table of Contents below, figure out what page or pages you'd look at to learn more about problems 1–8. Write the correct page number on the line to the right of the problem.

TABLE OF CONTENTS

The Real Numbers: Addition, Subtraction, Multiplication and Division

Real Numbers, 140. Absolute Value, 144. Addition, 148. Subtraction, 154. Simplifying Expressions, 160. Solving Equations, 164. Multiplication, 170. Division, 176. Repeating Decimals, 182. Problem Solving, 186. Review, 192.

PAGE(S)

1. Give the opposite of each number: a. 9 b. -2.7 _____

2. Give the absolute value of each number: a. 2.6 b. -6.7 _____

3. a. $-2.5 + -2.5 = n$
   b. $7.9 + 11.2 = n$ _____

4. Write an equivalent addition expression: a. $-10\ -4.6$
   b. $-3\ -1\frac{1}{4}$ _____

5. Find each quotient: a. $-3.6 \div 4$
   b. $1 \div .2$ _____

6. Solve each equation: a. $-15x = 10$
   b. $\frac{y}{5} = -2$ _____

7. Write a fraction for: a. .3333...
   b. .196196... _____

8. Find each product: a. $2\frac{1}{4} \times \frac{1}{2}$
   b. -5.3×2.1 _____

TWO MORE HINTS FOR DOING HOMEWORK

1. Use a pencil and a good eraser to do your work. When you do this, you never have to recopy.

2. Do your homework on graph paper. Using graph paper helps you to organize your work neatly.

UNIT VI SUMMARY: LEARNING FROM YOUR HOMEWORK

Your *study environment* is everything that surrounds you when you are learning. Find out what makes a good study environment for you. Then, be sure to do your math homework in your good study environment.

Use the following tips for doing your homework:

1. Be sure to bring home from school whatever you need to do your homework.

2. Have all your materials, for example, pencil and paper, your textbook, and your notes, within reach when you start to work.

3. Work on your homework for 25-45 minutes. Then, take a break for 5-10 minutes before you start again.

One kind of homework assignment your teacher will often give you is *chapter exercises.* Organize the way you do these exercises like this:

1. First, read the textbook section before the exercises.

2. Be sure to try the sample questions and problems in the reading on your own. Check yourself.

3. Try a few of the odd numbered problems in the chapter exercises. Check yourself.

4. Now that you understand what you're doing, do your homework problems.

Another kind of assignment your teacher will give you is *review exercises.* When you're not sure how to do a problem in the review exercises, look up that kind of problem in the Table of Contents or the Index. Use your resources in your textbook to learn how to do it.

UNIT VII: USING FORMULAS

INTRODUCTION

In this unit, you'll learn about *formulas.* You'll discover how you can use *formulas* to help you solve many kinds of math problems more easily.

AREA BY COUNTING

How can you find the area of a region? One way is to divide the region or figure into unit squares. Then, count the squares.

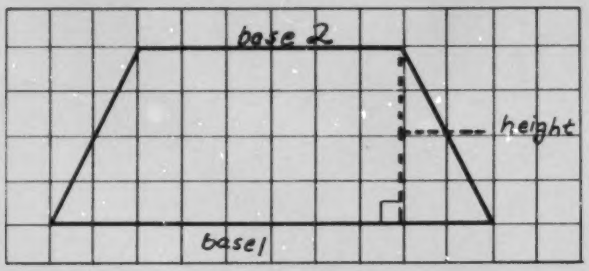
You can also count to find the base and height of a figure.

EXERCISE I

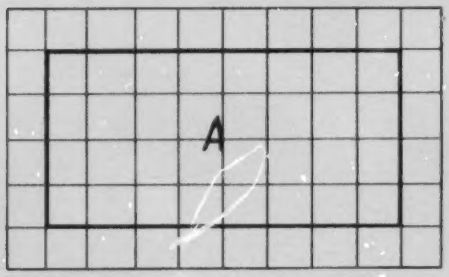
Directions: Count the number of squares in each figure below. (Remember to put parts of squares together to make whole squares.) Also, count to find the base and height of each figure.

Write the information that you find in the marked spaces next to each figure.

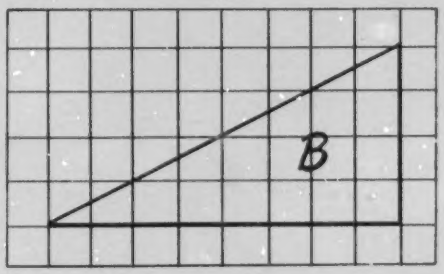
Example



32 squares
10 units base$_1$
6 units base$_2$
4 units height (altitude)

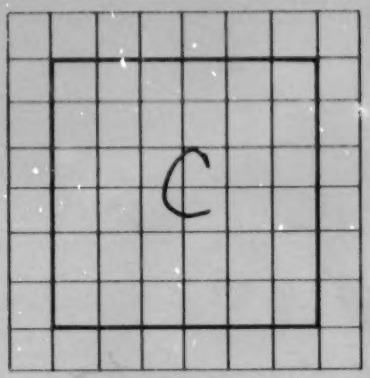


_____ squares
_____ length
_____ width



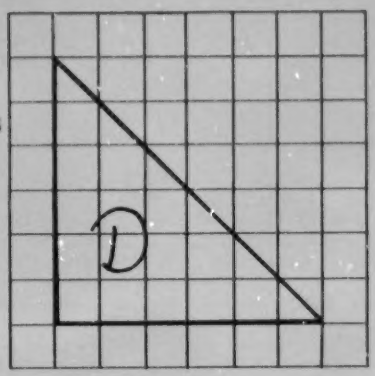
_____ squares
_____ base
_____ height (altitude)

Continued on Page 48



_____ squares

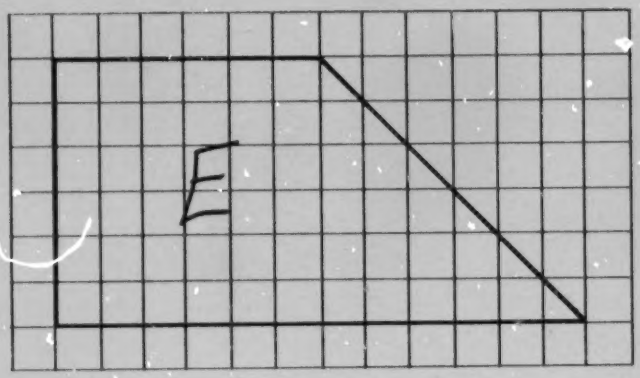
_____ side



_____ squares

_____ base

_____ height



_____ squares

_____ $base_1$

_____ $base_2$

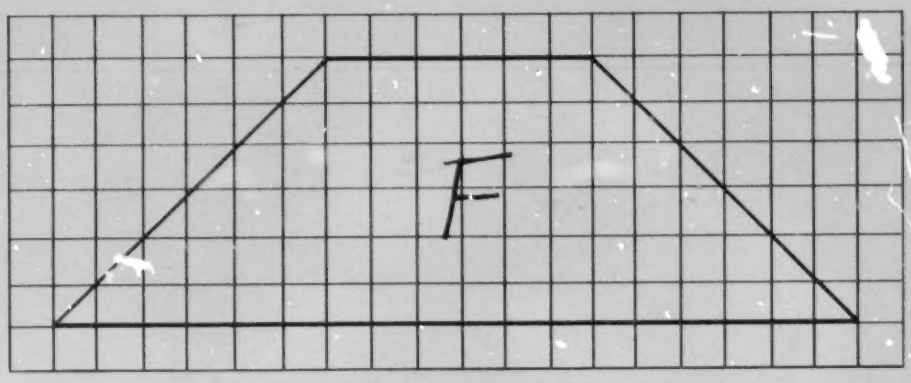
_____ height

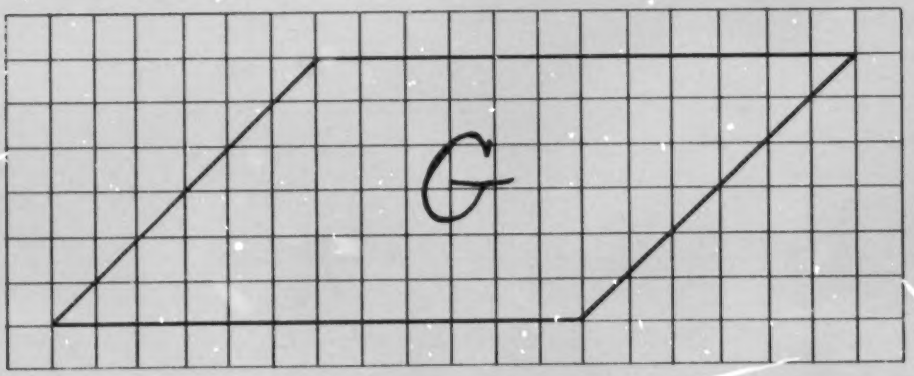
_____ squares

_____ $base_1$

_____ $base_2$

_____ height





_____ squares

_____ $base_1$

_____ $base_2$

_____ height

AREA BY FORMULA

You can always count to find the area of a region, but using a formula is easier.

A formula is a general rule which you can use to solve practical problems. It is written as an equation using symbols.

For example, the formula for the area of a rectangle is: $A = lw$. This formula means that you can find the area of a rectangle by multiplying its length times its width.

To use formulas, you need to:

1. Know the right formula to use for a particular problem.
2. Know what each symbol in the formula means.
3. Know how to replace the symbols or letters with the right numbers from the problem.

A good way to learn formulas is to write each one on the front of a separate 3 × 5 card. Write a sample problem using the formula on the back of the card, and then solve it. You can use these cards to help you memorize the formulas. You can also use them to study for a test.

Read the area formulas below carefully. Then, use them for the rest of the exercises in this unit.

AREA FORMULAS		
Rectangle	length × width	$A = lw$
Triangle	½ base × height	$A = \frac{1}{2}bh$
Square	side × side	$A = s^2$
Parallelogram	base × height	$A = bh$
Trapezoid	½ height × (base$_1$ + base$_2$)	$A = \frac{1}{2}h\ (b_1 + b_2)$

EXERCISE II

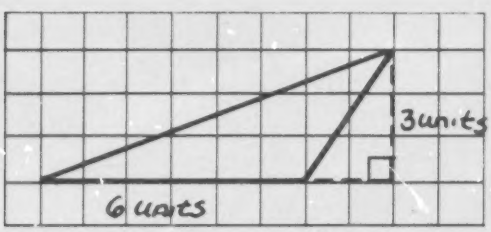
Directions: Look at the figures in Exercise I. Decide which formula should be used to find the area of each figure. Next to each formula below, write the *letter* of the figure or figures for which you'd use that formula.

FORMULAS	FIGURES
$A = lw$	_____
$A = \frac{1}{2}bh$	_____
$A = s^2$	_____
$A = \frac{1}{2}h(b_1 + b_2)$	_____
$A = bh$	_____

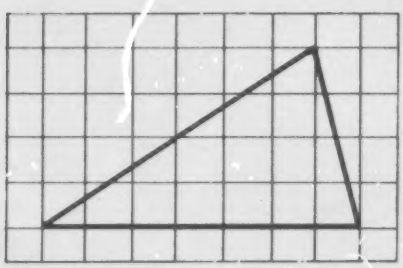
EXERCISE III

Directions: Find the base and height for each figure below. Draw the height if necessary. Label each figure as shown in the example.

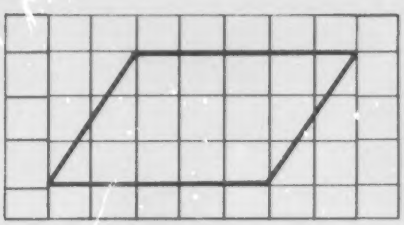
Example



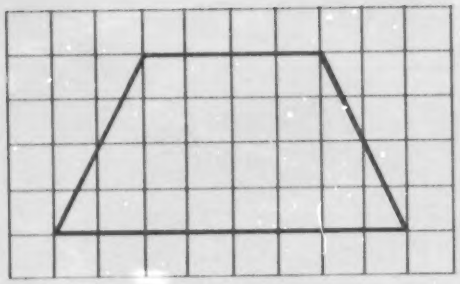
1.



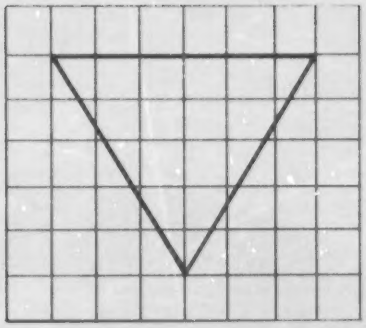
2.



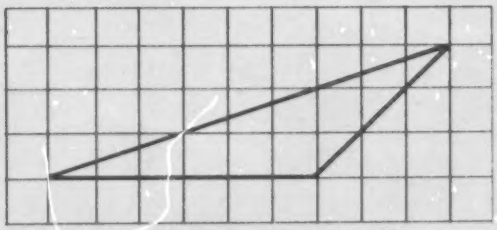
3.



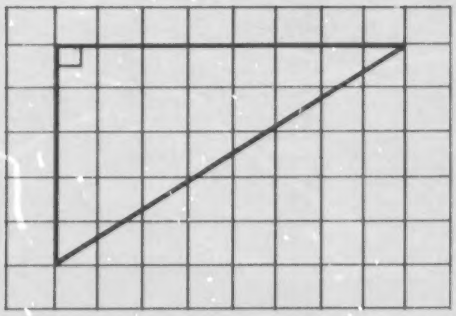
4.



5.



6.

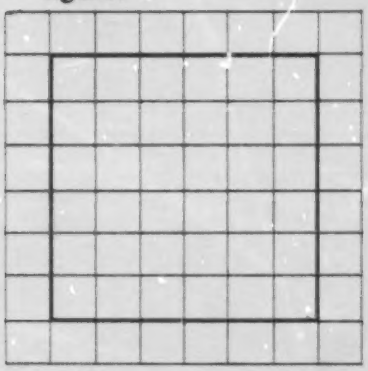


EXERCISE IV

Directions: Find the area of each figure below. First, choose the right formula. Then, write the equation and do the calculation.

In this exercise, you can check your work by counting the squares in each figure!

1.

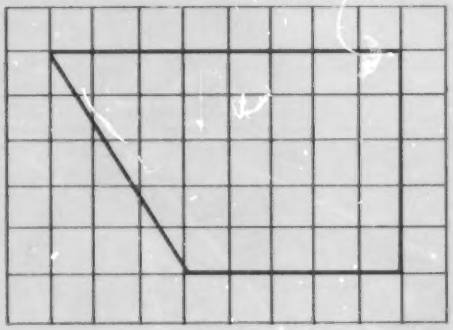


Formula _____

Equation _____

Area _____ units²

2.

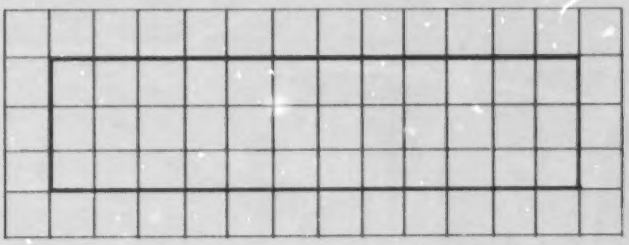


Formula _____

Equation _____

Area _____ units²

3.

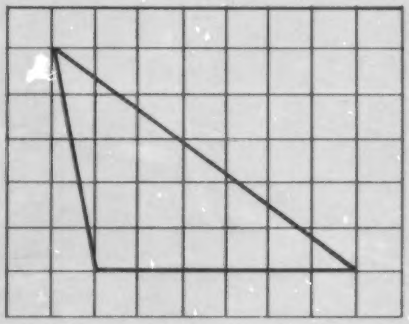


Formula _____

Equation _____

Area _____ units²

4.

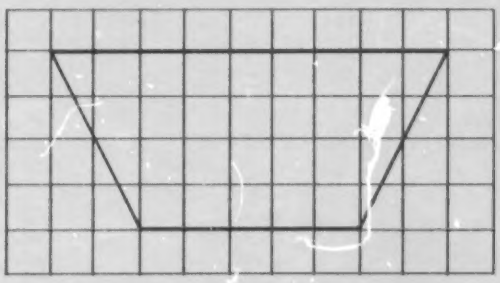


Formula _____

Equation _____

Area _____ units²

5.

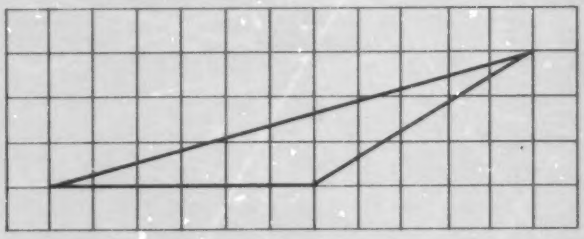


Formula _____

Equation _____

Area _____ units²

6.



Formula _____

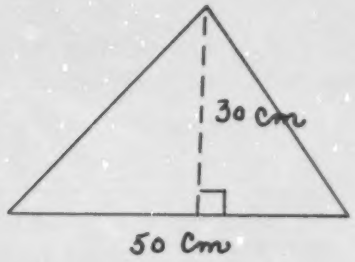
Equation _____

Area _____ units²

Exercise V

Directions: Find the area of each figure below.

1.

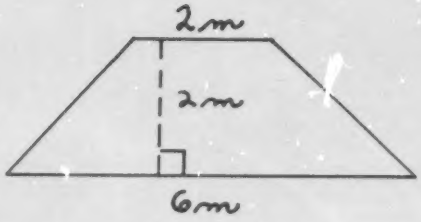


Formula _____

Equation _____

Area _____

2.

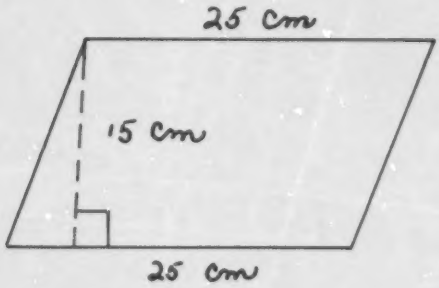


Formula _____

Equation _____

Area _____

3.

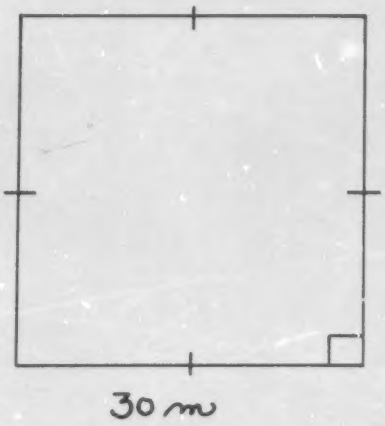


Formula _____

Equation _____

Area _____

4.

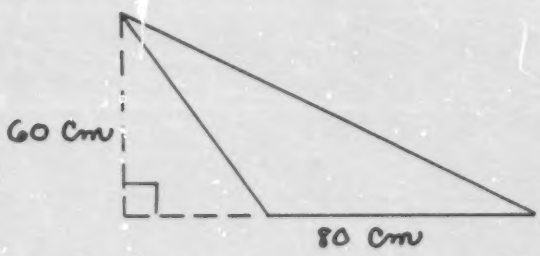


Formula _____

Equation _____

Area _____

5.

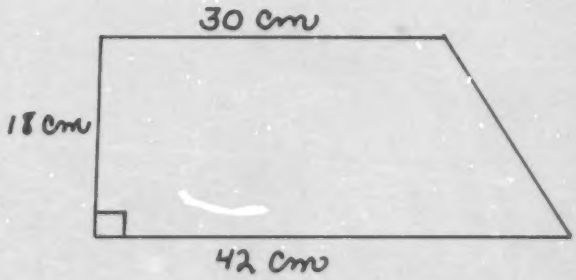


Formula _____

Equation _____

Area _____

6.



Formula _____

Equation _____

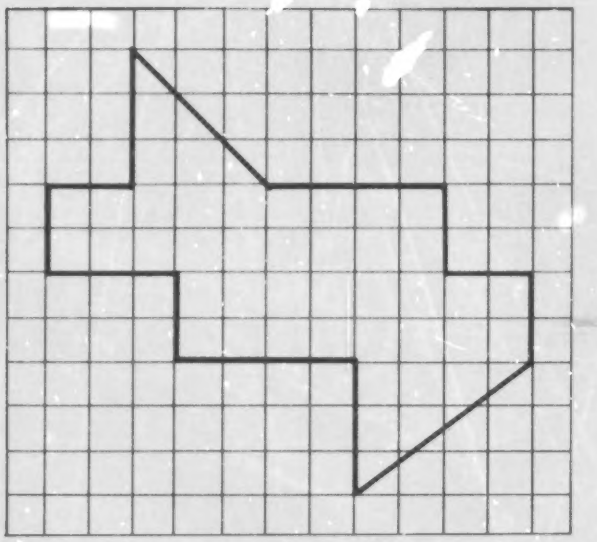
Area _____

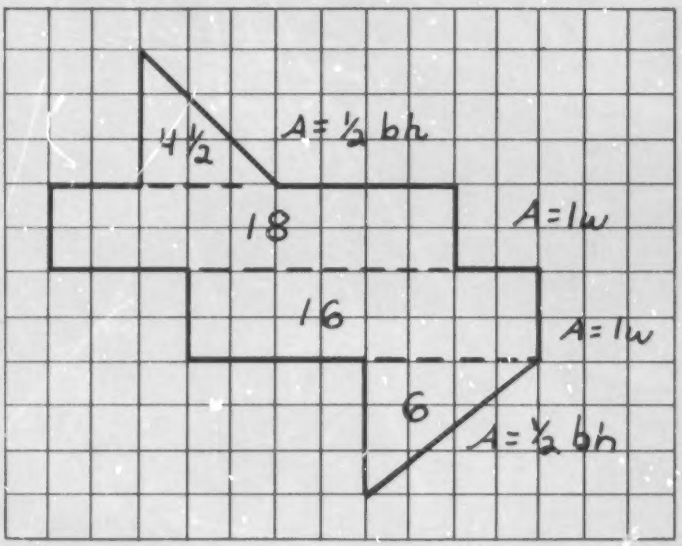
COMPOUND FIGURES

A compound figure is made up of several simple figures. Finding the area of a compound figure looks difficult. How do you do it?

First, break the compound figure down into simple figures that you already know. Find the area of each simple figure and then add all the areas together. Look at the example below to see how you do this.

REMEMBER: It's the same strategy you used when you broke down a difficult problem into simpler problems in Unit II.

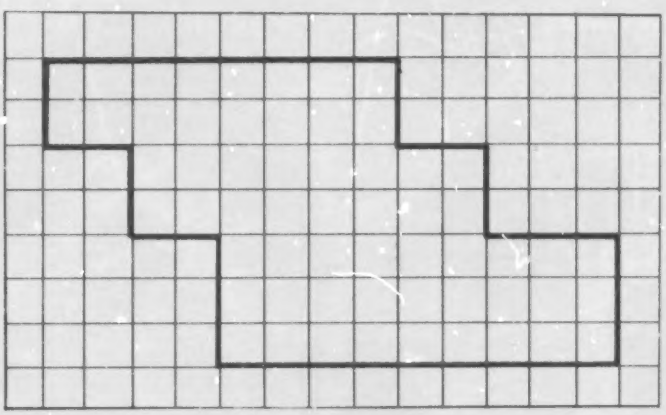




EXERCISE VI

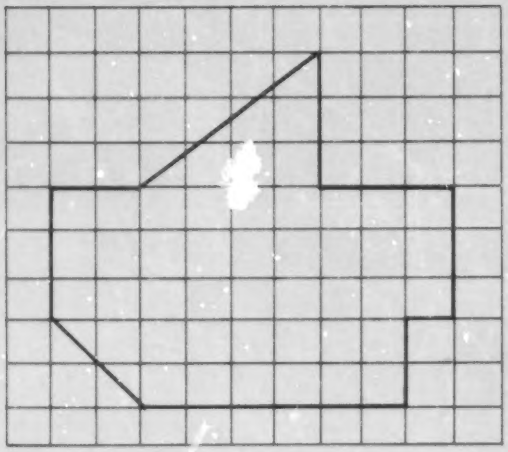
Directions: Find the area of each compound figure below. List each formula that you use as shown in the example above.

1.



A = _____ units²

2.

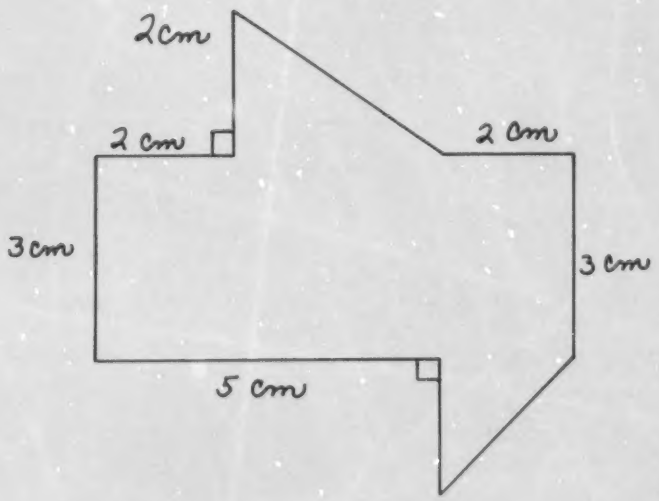


A = _____ units²

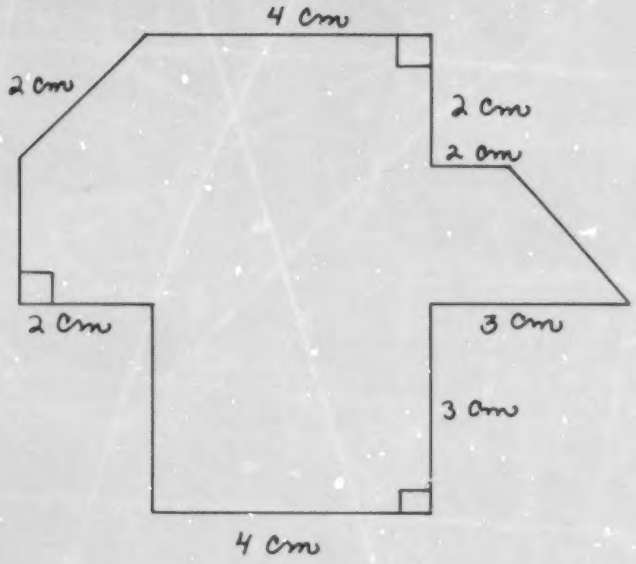
EXERCISE VII

Directions: Find the area of each compound figure below. List the formulas that you use as shown in the example on page 54.

1.



A = _____ cm²



A = _____ cm^2

EXERCISE VIII

Directions: Draw a compound figure in this space!

SOLVING WORD PROBLEMS WITH FORMULAS

You can use formulas to solve some word problems. When you read a problem, think about whether or not you know a formula that can help you solve it.

The key to using formulas to solve problems is recognizing situations when a formula will help.

EXERCISE IX

Directions: All the problems below involve area. For each problem write the formula that you would use, the equation, and the solution.

You are the landscape designer for the gardens in the new park. Before you order top soil, you must find the area of each garden.

1. The triangular marigold garden measures 15 meters at the base and 20 meters in height. What is the area of this plot of land?

2. The rose garden is rectangular and measures 20 meters in length and 10 meters in width. What is the area?

3. The zinnias occupy a square area which is 3 meters on one side. Find the area.

4. Find the area of the daisy garden. This parallelogram is 30 meters in length and 15 meters in height.

5. The blueberry bushes will be planted in a trapezoidal plot which is 25 meters on one base, 30 meters on the other base, and 10 meters in height. What is the area?

EXERCISE X

Directions: See if you can use the formulas below to solve word problems 1–5. Try to use these formulas in the same way that you used the area formulas.

Formula: $d = rt$ Distance traveled (d) equals the rate of speed (r) times the elapsed time (t).

1. A speed boat travels at 42 mph. How far can it go in 2½ hours?

Formula: $B = .006s^2$ Braking distance for a car in meters (B) is measured at .006 times the speed of the car in km/hr multiplied by itself (s^2).

2. A car is traveling at 80 km/hr. How far will it go after the brakes have been applied before coming to a complete stop?

3. If a car is moving at 100 km/hr, how far will it travel after the brakes have been applied?

Formula: $a = \frac{h}{b}$ Batting average (a) is determined by the number of hits (h) divided by the times at bat (b).

4. Denis got 12 hits in 28 at bats. What was his average?

5. Chris was at bat 18 times. She got 8 hits. What was her average?

UNIT VII SUMMARY: USING FORMULAS

A formula is a general rule which you can use to solve practical problems.

Formulas are written as equations using symbols.

To use formulas, you need to:

1. Know the right formula to use for a particular problem.
2. Know what each symbol in the formula means.
3. Know how to replace the symbols or letters with the right numbers from the problem.

Write each formula that you need to learn on the front of a 3 × 5 card. Write a sample problem using that formula on the back of the card and solve it. Use your cards to learn formulas and to study for tests.

UNIT VIII: ESTIMATION

THE "EDUCATED GUESSING" GAME

Directions: Below you'll find a math word problem printed upside down. Don't read the problem until your teacher asks you to begin.

You will have only 20 seconds to work on this problem. Within that short time, try to make an "educated guess" about the answer. *Don't start until your teacher tells you to begin!*

Your class is showing a movie to raise money. You have to pay $800 to rent the theater and the film. You sold 491 tickets at $1.99 each. Did your class make money?

Circle your answer: Yes No

ANOTHER "EDUCATED GUESSING" GAME

Directions: Follow the same instructions as above. Remember: you'll have only 20 seconds to work on the problem!

Two high school seniors are riding across the United States on bicycles. They are averaging 112 miles per day. If it is 2987 miles from San Francisco to New York, will they complete the trip in one month?

Circle your answer: Yes No

99

ESTIMATION

To make an "educated guess" about the problems on page 60, you had to *estimate.* When you *estimate,* you figure out approximately what the answer is.

An *estimation* is never the exact answer. Rather, an *estimation* is an approximate, a rough calculation. It gives you an idea of about what the answer is.

You probably already use estimation every day. For example, you estimate when you ask yourself, "Do I have enough money for a sandwich, a milk, and a cookie for lunch?" Or, when you multiply 23.46 × 12.5 with your calculator, you estimate to see if 293.25 is a reasonable answer.

This unit will help you learn how to estimate more effectively and how to use estimation as a helpful skill.

ROUNDING

Often the first step in estimating is rounding. You've probably had experience with rounding already. Look at the three examples below, and note that each is rounded to the largest place value.

Examples:

578	600
3,264,982	3,000,000
5,318	5,000

EXERCISE I

Directions: Round each number below to the largest place value.

1. 4,687 _____
2. 312,508 _____
3. 56.123 _____
4. 9,846 _____
5. 4,618,925 _____
6. 28 _____
7. $79.98 _____
8. $399.99 _____

POWERS AND MULTIPLES OF 10

When you work with numbers which have been rounded, you are multiplying and dividing with powers of 10 and multiples of 10. Working with these numbers is easier when you learn their "trick" or pattern.

Look carefully at the examples below. Do you see a pattern in them? When you discover the pattern, describe what it is on the lines below the examples.

a. $400 \times 10 = 4000$

b. $7000 \times 10 = 70{,}000$

c. $50 \times 100 = 5000$

d. $600{,}000 \times 10 = 6{,}000{,}000$

e. $30{,}000 \times 10{,}000 = 300{,}000{,}000$

f. $300 \times 20 = 6000$

g. $300 \times 200 = 60{,}000$

h. $300 \times 40 = 12{,}000$

i. $300 \times 400 = 120{,}000$

j. $5000 \times 6000 = 30{,}000{,}000$

What is the pattern?

EXERCISE II

Directions: Your teacher will divide the class into two groups. The people in Group A must use their calculators. The people in Group B will multiply in their heads. Which group do you think will finish first?

_____

Do the examples below as quickly as you can. Write your answers in the spaces next to the examples. *Don't start until your teacher tells you to begin!*

a. $50 \times 30 =$ _____

b. $4000 \times 100 =$ _____

c. $60{,}000 \times 300 =$ _____

d. $2000 \times 400 =$ _____

e. $80 \times 400{,}000 =$ _____

f. $500 \times 5000 =$ _____

g. $8000 \times 5000 =$ _____

h. $3{,}000{,}000 \times 30 =$ _____

RAISE YOUR HAND AS SOON AS YOU FINISH. In the space below, write the number which your teacher gives you.

_____

DIVIDING WITH POWERS AND MULTIPLES OF 10

When you divide with powers and multiples of 10, there's also a pattern which you can discover to help you. Can you guess what this pattern is?

Look at the examples below, and find the pattern. Then, describe the pattern on the lines under the examples.

a. $7000 \div 10 = 700$

b. $7000 \div 100 = 70$

c. $7000 \div 1000 = 7$

d. $50{,}000 \div 100 = 500$

e. $500{,}000 \div 100 = 5000$

f. $60{,}000 \div 30 = 2000$

g. $810{,}000 \div 900 = 900$

h. $1{,}200{,}000 \div 40 = 30{,}000$

i. $200{,}000 \div 500 = 400$

What is the pattern?

EXERCISE III

Directions: For this exercise, students in Group B must work with their calculators. Students in Group A will divide in their heads.

Do the examples as quickly as you can. Write your answers in the spaces next to the examples. *Don't start until your teacher tells you to begin!*

a. 90,000 ÷ 10 = _____

b. 4000 ÷ 100 = _____

c. 600,000 ÷ 1000 = _____

d. 50,000,000 ÷ 1,000,000 = _____

e. 80,000,000 ÷ 4,000,000 = _____

f. 24,000,000 ÷ 60,000 = _____

g. 300,000 ÷ 300 = _____

h. 35,000,000 ÷ 5,000 = _____

RAISE YOUR HAND AS SOON AS YOU FINISH. In the space below, write the number which your teacher gives you.

_____

THE JELLYBEAN GAME

Directions: Estimate each answer by rounding to the highest place value and multiplying or dividing as directed by the sign in each example. Write your answers in the spaces provided.

You will have a time limit, so work quickly and carefully. Your teacher will tell you when to stop. *Don't start until your teacher tells you to begin!*

a. 8723 × 1191 = _____

b. 18,257 × 3264 = _____

c. 79,041 × 604 = _____

d. 48,313 ÷ 1234 = _____

e. 19,709 ÷ 3812 = _____

f. 5298 × 4713 = _____

g. 276,050 ÷ 6187 = _____

h. 42,222 × 561 = _____

i. 436,000 ÷ 8129 = _____

j. 72,489 × 680 = _____

If you finish before your teacher asks you to stop, RAISE YOUR HAND.

Scoring

You have earned 1000 jellybeans for each good estimate. How many jellybeans do you get?

_____

72

NUMBERS BETWEEN 0 AND 1

Every time you find a good rule, there always seems to be an exception. This is true in mathematics and in many other subjects as well. For example, do you remember the spelling rule "... i before e, except after c ...?"

When you multiply and divide with numbers between 0 and 1, you find exceptions to the patterns you've already discovered in this unit.

Look at the examples below, and see if you can find the patterns for multiplying and dividing with numbers between 0 and 1. Then, describe these patterns on the lines under the examples.

$200 \times 100 = 20{,}000$	$400 \div 100 = 4$
$200 \times 10 = 2000$	$400 \div 10 = 40$
$200 \times 1 = 200$	$400 \div 1 = 400$
$200 \times .1 = 20$	$400 \div .1 = 4000$
$200 \times .01 = 2$	$400 \div .01 = 40{,}000$

What pattern(s) do you see?

_____

_____

_____

_____

THE JELLYBEAN GAME: ANOTHER CHANCE

Directions: It takes practice to learn to estimate quickly. You'll probably work faster the second time you play.

The directions are the same as before. *Don't start until your teacher tells you to begin.*

a. 84,313 ÷ 4329 = _____

b. 39,211 ÷ 4769 = _____

c. 6314 × 3727 = _____

d. 385,111 ÷ 7816 = _____

e. 598,007 × 66 = _____

f. 636,219 ÷ 3019 = _____

g. 889,942 × 8 = _____

h. 8732 × 2196 = _____

i. 27,852 × 524 = _____

j. 290,676 ÷ 6410 = _____

If you finish before your teacher asks you to stop, RAISE YOUR HAND.

Scoring

Each good estimate earns you 1000 jellybeans. How many jellybeans do you get?

_____

WHEN DO YOU ESTIMATE?

Now that you have learned how to estimate, when can you use this skill? One good use of estimation is to check answers that you've gotten with your calculator or through computation. Sometimes you make mistakes, and a quick estimate will tell you right away if your answer is reasonable or not.

EXERCISE IV

Directions: Place a check next to the answers below which do *not* seem reasonable.

a. $90{,}000 \div 3 = 30{,}000$ _____

b. $6000 \times .2 = 1200$ _____

c. $3000 \times .04 = 120{,}000$ _____

d. $800 \div .2 = 400$ _____

e. $20{,}000 \times 60 = 12{,}000$ _____

f. $5000 \div .1 = 50{,}000$ _____

g. $700{,}000 \times .06 = 42{,}000{,}000$ _____

h. $4{,}000{,}000 \div .02 = 200{,}000{,}000$ _____

ANOTHER USE FOR ESTIMATION

Sometimes you only need to know if an answer would be between two numbers. You don't need to find an exact answer.

For example, if you want to know if the sum of 6841 and 8992 is between thirteen thousand and eighteen thousand, you can use estimation to help you find the answer:

$$6841 + 8992 = _____$$

$$7000 + 9000 = 16{,}000$$

The answer is *yes.*

EXERCISE V

Directions: Circle the letter of the examples below in which the solution is a number between 50,000 and 90,000.

a. $4986 + 42{,}684 + 7182$

b. $136{,}482 - 58{,}100$

c. 289×456

d. $168{,}058 \div 2115$

e. $425{,}316 \div .3$

f. $186{,}145 \times .2$

g. $121{,}360 - 61{,}234$

h. $54{,}012 + 18{,}681 + 48{,}977$

ESTIMATION AND PROBLEM SOLVING

Often estimation is a good problem solving strategy. It's particularly helpful when you don't need to find exact answers.

After you've read a problem, ask yourself: can I use estimation to help me solve this problem?

EXERCISE VI

Directions: Solve the problems below using estimation.

1. Each carton holds 94 paperback books. How many books are there in 189 cartons? Is the answer closer to 1890, 18,900, or 189,000? _____

2. If you had $50, which of the following could you buy? Place a check next to the groups for which you have enough money.

   a. radio ($29.95) and hair dryer ($19.88) _____

   b. lamp ($34.95) and footstool ($10.99) _____

   c. camera ($37.50) and flash attachment ($15.99) _____

   d. tire ($38.98) and antenna ($9.99) _____

   e. calculator ($19.95) and jacket ($27.95) _____

   f. coat ($39.95) and sweater ($12.98) _____

   g. boots ($36.98) and gloves ($18.50) _____

GUESS AND CHECK

Another problem solving strategy using estimation is *guess and check*. To use this strategy, you read the problem, make a guess, and check your guess. Then you use the information you've gained from the checking to make a better guess. You repeat these steps until you find the answer.

Look at the example of *guess and check* below:

How many times does 13 go into 299?

Guess 1 20 Check 260

Guess 2 25 Check 325

Guess 3 23 Check 299

77

EXERCISE VII

Directions: Use the *guess and check* strategy and your calculator to solve the problems below.

1. How old is Cindy? If you multiply her age times itself 4 times, you get 531,441.

Guess 1 20 Check 160,000

Guess 2 _____ Check _____

Guess 3 _____ Check _____

Guess 4 _____ Check _____

Guess 5 _____ Check _____

2. Find 2 numbers whose sum is 400 and whose difference is 6.

Guess 1 _____ _____ Sum _____ Difference _____

Guess 2 _____ _____ Sum _____ Difference _____

Guess 3 _____ _____ Sum _____ Difference _____

Guess 4 _____ _____ Sum _____ Difference _____

Guess 5 _____ _____ Sum _____ Difference _____

3. Compute the answer to six decimal places:

36 ÷ 11 = ☐

58 ÷ 11 = ☐

☐ ÷ 11 = 2.272727

UNIT VIII SUMMARY: ESTIMATION

When you estimate, you figure out approximately what the answer is. An estimation is not an exact answer.

To become a good estimator, you need to practice:

1. Rounding off numbers
2. Computing with numbers which have been rounded
3. Mental arithmetic, or computing in your head

You can use estimation to check answers that you've gotten with your calculator or through computation. A quick estimate will tell you if your answer is reasonable or not.

Estimation is also a useful skill for problem solving. One special way of using estimation to solve problems is the guess and check strategy. You read the problem, make a good guess about the answer, and check your guess. Then you use the information you've gained from the checking to make a better guess. You repeat these steps until you find the answer.

UNIT IX: PREPARING FOR A TEST

HOW DO *YOU* PREPARE FOR A TEST?

It's Monday morning. At the end of class, your math teacher announces, "We'll have the unit test on Friday. I'm telling you now so you'll have all week to get ready."

What do *you* do when you hear an announcement like this? Some students ignore it and choose to come to the test unprepared. Most students try to study, but usually they wait until Thursday night. And often that's just too late.

How do *you* prepare for a math test? On the lines below, describe what you do to get ready for a math test. This is for you only, so be honest with yourself. You won't be asked to show what you write to anyone.

GETTING STARTED: WHAT GETS IN THE WAY?

How you feel about what you're doing always influences how well you can do it. Think about something that you do well. How do you feel when you do this activity? Do you feel good about yourself? Confident?

How do you feel when you start to get ready for a math test? Close your eyes for a few seconds, and remember the last time you prepared for a math test. Let yourself feel what you felt then.

Now, read the statements below. Check the *three* statements which best describe how you usually feel before a math test.

1. _____ I feel good because I know I can do well on the test.
2. _____ I always feel scared because I know I don't know enough.
3. _____ I feel a little nervous, but mostly I feel okay because I know most of the material and can learn the rest.
4. _____ I feel nervous and edgy.
5. _____ I'm looking forward to reviewing because it helps me really understand the unit.
6. _____ I feel anxious because I'm worried that I'll get a bad mark.
7. _____ I feel calm and confident.
8. _____ I feel that I'm about to panic.
9. _____ I feel involved because I want to make sure that I understand what will be on the test.
10. _____ I just freeze because I don't even know where to start.

If you checked two or three statements above with even numbers, you probably find that nervousness or anxiety gets in your way when you try to study. Anxiety is an edgy, uncomfortable feeling. Some people feel it like a pit in their stomach. Others feel it like whizzing butterflies. Some people get headaches when they feel anxious, or they feel warm and sweaty.

Feeling anxious about a test is very natural. Everyone feels that way. It doesn't mean there's anything wrong with you.

A little bit of anxiety or nervousness can be helpful. You have more energy, and your senses are sharper. You may even think more clearly.

Continued on Page 76

But too much anxiety gets in the way of learning. When you really feel nervous or panicky, it's hard to think straight. And you certainly can't learn well.

What can you do to feel less nervous about a test? One good step you can take is to have a plan for how you're going to prepare for the test. Then, follow your plan. When you do this, you can feel more comfortable about getting ready for a test.

This unit will show you one helpful plan for getting ready for a math test.

(Even if you checked two or three statements above with odd numbers, you can still learn from this unit. You can probably create an even better way to prepare for your math tests!)

PREPARING FOR A MATH TEST

To prepare for a math test, you need to plan ahead. This means that you can't wait until the night before the test to do all of your studying. Your memory works much better if you learn a little bit each day for several days than if you try to learn everything at once.

Begin to study a few days before the test. Even 20 minutes each night can be enough time.

To prepare well, you also need to be actively involved. Just reading over your book won't help much. You need to practice whatever you've learned, not just look at it.

EXERCISE I

Directions: Below you'll find the steps for preparing for a math test. Read each step carefully. *Follow all of the underlined instructions in each step.*

STEP 1: DEFINE SCOPE OF TEST

- *Tell yourself what kind of test you're going to take.* Is it a short quiz? A chapter test? An exam?

  PLEASE NOTE: In this unit, you will be preparing for a chapter test. Remember that you can use this method for any kind of test.

CHAPTER TEST

- *From memory, list the major topics from the chapter which you have been studying. Write these topics on the lines below.*

- *Now, look through the chapter in your textbook, and add to your list any major topics which you have left out.*

Continued on Page 78

- *Decide which topics are most important, and put a star next to these topics.*

  Usually you can figure out which topics are most important in two ways: (1) think about which topics you've spent the most time on in class; and (2) remember what your teacher has said about what's important in this chapter. Also, when your teacher reviews for the test, she or he will let you know what the main topics are.

- *Beside each starred topic on your list, write the page number in your textbook on which it was introduced.* This will help you find the topics more quickly in step #4.

STEP 2: REVIEW EASIER MATERIAL

- *Choose one of the starred topics which you know the most about, and write the topic on the front of a 3 × 5 card. Find a sample problem for this topic from the odd numbered problems in your book. Write the problem on the front of your card, also. Then, solve the problem on the back of the card. Check your work!*

  Remember: You can usually find the answers to the odd numbered problems in the back of your textbook.

To know if you really understand a topic, you need to practice with it. When you do this practice on a 3 × 5 card, you can make a review card at the very same time! Review cards are very handy for last-minute studying and getting ready for exams. Look at the sample review card below.

SAMPLE REVIEW CARD

Front

Absolute Value

$|-8+4|$

$|7+-2|$

Back

$|-8+4| = |-4| = 4$

$|7+-2| = |5| = 5$

- *Now, choose two more starred topics which you understand well, and make a review card for each of them.*

Work through the starred topics as described above. Start with the easiest ones and move towards the hardest. Practice a problem for each topic, and make a review card.

STEP 3: REVIEW MORE DIFFICULT MATERIAL

But what do you do when you come to a topic that you don't understand?

- *Read all of the suggestions below. Place a check next to each suggestion which you'd find helpful in reviewing a hard topic.*

_____ Plan to ask the teacher tomorrow in class.

_____ Take a five minute break.

_____ Try the sample problems which come before the exercises.

_____ Turn on the TV.

_____ Check your old homework papers about this kind of problem.

_____ Plan to do the hard problems tomorrow.

_____ Try some odd numbered problems which have answers in the back of the book.

_____ Telephone a friend who might be able to help.

_____ Ask your parents or brother or sister.

_____ Check your old quizzes and tests which you've kept in your notebook.

_____ Read the explanation which comes before the exercises in your book.

- *Now, go back over the suggestions which you've checked, and number them in the order in which you'd really use them.* For example, put a #1 next to the suggestion you'd try first, a #2 next to the one you'd try next, and so on.

- *Now, underline the suggestions which you have listed as #1, #2, and #3.*

STEP 4: MAKE REVIEW CARDS FOR RULES AND FORMULAS

- *Make review cards for any rules, principles, and formulas that you need to know for this chapter.*

  Often you'll need to memorize rules, principles, and formulas. Many people find that studying them for a few minutes at a time makes memorization easier. One way to do this is to place the review cards around your house where you'll see them often, for example, on the refrigerator.

- *On the lines below, list three places where you'd put your review cards for memorizing formulas and rules.*

1. _____

2. _____

3. _____

STEP 5: FINAL REVIEW

On the night before the test, do your final review. Or you can do this during a free period before your math class.

Shuffle your stack of review cards. Pick one, write down a quick solution to the problem on the card, and check your work against the back of the card. Work through all the cards like this. If you want to review any topics more than once, put those cards on the bottom of the pile when you're done with them. Then, you'll get another chance with that topic.

When you've finished with the review cards, make up some questions which you think your teacher might ask. Then, answer them! (Keep these questions to see how good you can become at "second guessing" your teacher.)

- *In the spaces below, make up three questions, each of a different type, which you think your teacher might ask on the test for this chapter. Then, solve each question.*

Question: _____

_____

Solution:

Continued on Page 82

Question: _____

_____

Solution:

Question: _____

_____

Solution:

THE NIGHT BEFORE THE TEST

Now it's the night before the test. You've studied all of your review cards, and you're ready! What else can you do to prepare?

Get a good night's sleep. The more rested you are, the more you'll be able to show what you know on the test.

WHAT CAN YOU DO WHEN YOU FEEL NERVOUS?

What can you do when you're studying according to your plan and you still feel nervous? Or if you've walked into class right before the test and you suddenly feel very anxious?

You can learn a way to let go of your nervous feelings and relax. In fact, even when you're not too nervous, *relaxing and focusing your attention* before you start to study can help you learn better.

Your teacher will show you how to do this. Close your book, and listen carefully to your teacher's instructions.

A FEW NOTES ABOUT RELAXING

Now that you've practiced relaxing, you can relax anytime that you want to do so. You'll find the instructions for the relaxation exercise printed below. Read them over a couple of times. Then, with your own inner voice, you can guide yourself into relaxing.

REMEMBER: There is no right or wrong way to relax. The way that you've just practiced is one that works for many people but not for everyone. You can change it in any way that makes it feel better to you.

REMEMBER: If you don't see inner pictures clearly, that's okay. Some people just don't. You don't need to see pictures to relax. Instead be aware of your breathing for a longer time. Follow your breath coming in and going out. Then tell yourself, "I am relaxed and awake and ready to learn." Repeat this three or four times before you open your eyes.

REMEMBER: When you relax, be sure to stay awake and alert. It's not hard to do this. If you relax but don't stay alert, you might get sleepy. And that won't help you study.

REMEMBER: Relaxing before you study can be very helpful. You can also take a minute to relax before you take the test, too. This can help you concentrate on the test better.

RELAXATION EXERCISE

Sit in a comfortable position.

Close your eyes and take a couple of smooth, deep breaths. Feel the air come in all the way down into your abdomen, then feel the air go out again.

Now, sit quietly and just be aware of your breathing for a little while. Don't try to control it. Just be aware of your breath coming in, your breath going out.

Now, with your inner eye, imagine a peaceful scene that you like. See this peaceful scene as clearly as you can. What do you see? What do you hear? What do you feel? Make this scene very, very peaceful.

Continued on Page 84

Do you see yourself in your peaceful scene? If you're not already there, put yourself there if you can. And feel the relaxation of this peaceful, calm place. Feel yourself very relaxed, and wide awake.

Now, with your inner voice, tell yourself: I am relaxed and awake and ready to learn. I am relaxed and awake and ready to learn. Say this two or three times more.

Now, gently open your eyes. You're ready to begin your learning!

UNIT IX SUMMARY: PREPARING FOR A TEST

Anxiety or nervousness about a test is a very natural feeling. Everyone feels this way at times. But too much anxiety can get in your way when you're studying for a test.

One good way to feel calmer is to have a plan for preparing for the test. Then, follow your plan.

Begin your studying a few days before the test. Even 20 minutes a night can be enough time.

List the major topics on which you'll be tested.

Make a review card for each major topic. A review card includes the topic and a sample problem for that topic on the front of the card, and the solution to the problem on the back.

Also, make review cards for any rules, formulas, and principles that you need to know. Use the cards to help you memorize the formulas, rules, and principles.

Use all of your review cards to do a final review before the test.

If you feel too nervous or anxious to study, relax yourself by using a relaxation exercise like the one in this unit.

Be sure to get a good night's sleep before the test!

UNIT X: TAKING A MATH TEST

THREAT OR CHALLENGE?

Imagine that you're a player on a team that's getting ready for a big game. Or that you're a member of a band or chorus that's about to play a holiday concert. How would you feel about looking forward to events like these?

Many people see a game or a concert as a challenge. They want to do well, and so it brings out the best in them.

But what about a test or an exam? The same people often see a test as a threat. Yet isn't a test very much like a game or a concert?

What's the difference between a *challenge* and a *threat*? On the lines below, describe what you think the difference is.

_____

_____

_____

_____

_____

CHALLENGING YOURSELF IN MATH

How can you make a math test into a challenge rather than a threat? One way to do this is to study in the way you learned in Unit IX. When you plan and work ahead for a test, you'll feel less threatened by it. It won't be scary because you'll be ready for it.

Another way to challenge yourself is to set a goal for the test. When you start to prepare for the test, ask yourself: what is my goal for this test? Then, answer your own question. Be sure that the goal you set is *realistic* and *challenging*.

Think for a few seconds about the test that your teacher just announced. Now, on the line below, write your goal for this test.

_____

A third way to help yourself see a math test as a challenge, not a threat, is to understand how tests work. The more that you know about how test questions are made, the more you'll know about how to answer them. This unit will help you learn more about how test questions actually work.

WHO MAKES UP TESTS?

Your teacher makes the tests for your class. The tests in your math book were written by the author. Sometimes you take standardized tests. These are created by people who write "test items" or questions which they store in a computer. They take groups of these questions and put them together to make a test. Then the test itself is tested out with many students to see how good the "test items" are.

The kinds of questions used most often in math tests are:

multiple choice questions
matching questions
true/false questions
'show your work' problems

MULTIPLE CHOICE

Multiple choice questions ask you to choose the right answer from a group of possible answers. The incorrect choices are often selected because they show common mistakes which students make. Look at the example below to see how this works.

Example

$14 + 8 = 8 + \square$ What number goes in the $\square$?

(A) 6
(B) 14
(C) 16
(D) 22

What is the correct answer? _____

Explain what you think a student might have done to choose the following as the right answer:

a. 6 _____

b. 16 _____

c. 22 _____

EXERCISE I

Directions: Write four possible answers for each of the multiple choice questions below. Include the correct answer and three others which show common mistakes that people could make.

1. $251 - 26 + 42 =$

(A) _____ (B) _____

(C) _____ (D) _____

2.
$$\begin{array}{r} 4.2 \\ \times\ 0.3 \\ \hline \end{array}$$

(A) _____ (B) _____

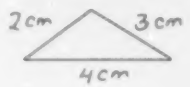
(C) _____ (D) _____

3. How many 20¢ stamps will $4.53 buy?

(A) _____ (B) _____

(C) _____ (D) _____

4. What is the perimeter of the triangle below?



(A) _____ (B) _____

(C) _____ (D) _____

TIPS FOR MULTIPLE CHOICE QUESTIONS

1. Read the question carefully. Then, see if you can figure out the answer to the question *before* you even look at the choices.

2. Read *all of the choices* given, and pick the *best* answer. Some questions give two or more answers which are right in some way. You need to pick the one which is the best answer.

3. Be sure to read *all* of the choices given, even if the first or second one seems right. They may all be correct, and the last choice may be "all of the above."

4. If you don't know which answer is right, cross out all of the ones which you know are *wrong*. Then, pick the best answer from the remaining choices. If you still don't know which answer is best, make a good guess, unless your teacher tells you not to guess.

5. When it's helpful, "plug" your answer into the question to see if it works.

MATCHING

A matching question will usually give you two lists of information. It will then ask you to connect the lists with each other in some way.

When you do a matching question, first read the directions carefully. Be sure you understand them. Then, use a *process of elimination* to match the items on the two lists:

> Do the ones that you know first. When you've matched an item, cross out its number or letter, so you know that you've already done it.
>
> Then, do the best you can with the items left. Guess if you need to do so.

EXERCISE II

Directions: Match the *suggestions* in Column I with the *reasons* in Column II.

Column I	Column II
1. Quickly read over the entire test.	_____ You might get it right, and that's better than leaving it blank.
2. Plan how you'll use your time for the test.	_____ It's important to know the length of the test and the type of questions asked, so you can plan your time.
3. Read he instructions carefully.	_____ One question might give you an idea about how to do another question.
4. Read the questions carefuily.	_____ If you read the instructions incorrectly, you could do a whole group of questions in the wrong way.
5. Answer the questions that you are sure of first.	_____ You don't want to run out of time only part of the way through the test.
6. Look for helpful hints as you do the questions.	_____ Doing these questions will give you confidence.
7. If you don't know, make a good guess.	_____ Some questions can be very tricky.

TRUE/FALSE

True/false questions are statements which you are asked to judge: are they true or false? They can be tricky.

When you do true/false questions, keep these tips in mind:

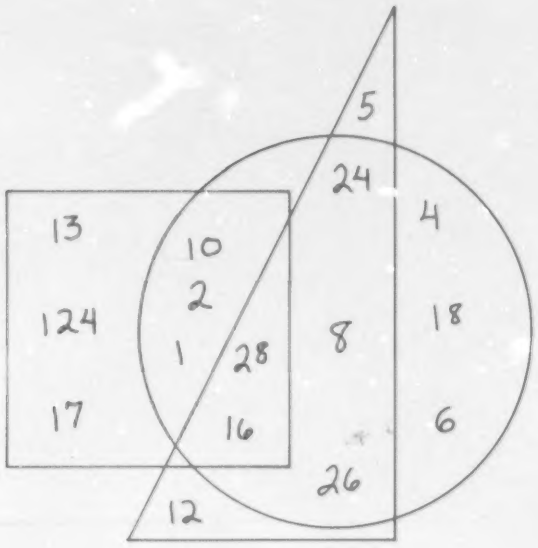
1. Read the question carefully. If any part of the statement is false, then it is a false statement.

2. Watch for *key words* like the ones listed below. Think about what these words mean in the statement. They can help you make a decision.

   always only all never usually often none

EXERCISE III

Directions: For each statement below, underline the *key word.* Then, judge the truth of the statement, and mark it *true* or *false.*



_____ 1. All the numbers in the circle are even.

_____ 2. None of the numbers in the square are evenly divisible by three.

_____ 3. Most of the numbers in the triangle are even.

_____ 4. An even number times an odd number is always an even number.

_____ 5. Of the numbers in the square, only some are prime numbers.

_____ 6. All prime numbers are odd numbers.

_____ 7. There are only three numbers which are in all three figures above.

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'SHOW YOUR WORK' PROBLEMS

Many math tests include a series of problems which you are asked to solve. You are expected to *show your work* and *your final solution.*

When you work on math problems, keep these tips in mind:

1. *Show all of your work.* Write down everything that you do. Teachers usually give partial credit even if the final answer is wrong. The more work that you show, the more points you can earn.

2. Organize your work on your paper so your teacher can follow it easily. The neater your work is, the more able your teacher will be to follow what you've done.

3. If you are running out of time, outline the steps you would follow to solve the problem. You might earn partial credit for showing your understanding of the problem.

4. Use a pencil. In math, you often have to erase.

EXERCISE IV

Directions: Read the problem and the four solutions below. Decide how many points you would give for each solution, and write the points you've given on the lines provided.

> 1¢ SALE
>
> Buy One At Regular Price,
> Get The Second One For 1¢

Lee bought two bottles of shampoo at the sale. The regular price was $1.79. The average price per bottle is how much less than the regular price?

Solution 1

$$\begin{array}{r} \$1.79 \\ +\ .01 \\ \hline \$1.80 \end{array}$$

$1.80 ÷ 2 = $.90

Ans. $.90

Possible points: 10 _____ points

Solution 2

$$\begin{array}{r} \$1.79 \\ +\ .01 \\ \hline \$1.80 \end{array}$$

$1.80 ÷ 2 = $.90

$$\begin{array}{r} \$1.79 \\ -\ .90 \\ \hline \$\ .79 \end{array}$$

Ans. $.79

Possible points: 10 _____ points

Continued on Page 92

Solution 3

Ans. 90¢

Possible points: 10

_____ points

Solution 4

$$\begin{array}{r} \$1.79 \\ +\ .01 \\ \hline \$1.80 \end{array} \qquad 2\overline{)\$1.80} \quad \$\ .90 \qquad \begin{array}{r} \$1.79 \\ -\ .90 \\ \hline \$\ .89 \end{array}$$

Ans. $.89

Possible points: 10

_____ points

TESTS AND COMPUTER CARDS

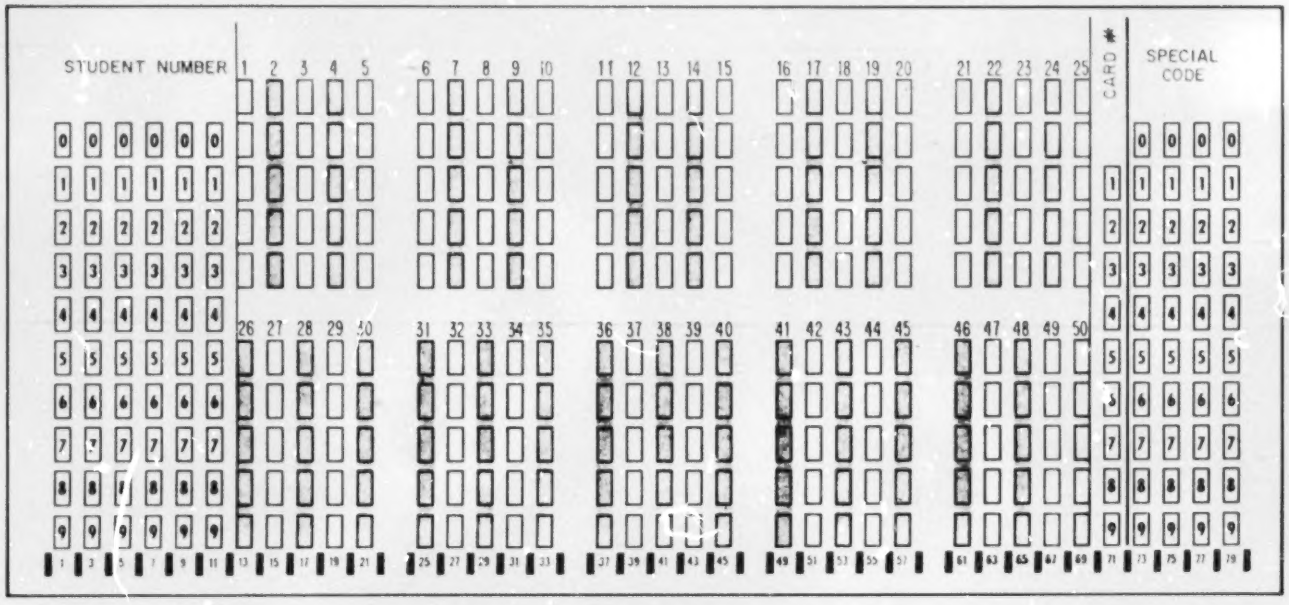
Computers are often used for scoring tests. With a computer scored test, you must record your answers by placing an X in the correct box on the computer card. The boxes are usually small, so it's easy to make a mistake when you mark your answers on the computer card.

The only way to avoid this kind of mistake is to be very careful. The exercise below will give you a chance to practice marking answers on a computer card.

EXERCISE V

Directions: Follow the numbered instructions below. You'll need to read them carefully. When you mark any box on the computer card, do so by placing an X in that box.

1. Write all information and answers on the computer card at the top of page 93.
2. Your student number is 020035. Fill in the correct boxes on the card for this number.
3. This is card #1. Fill in the correct box for the card number.
4. The special code for this test is 1549. Fill in the special code.
5. This is a standard card which can be used for any test. Although there is room for answers to 50 questions, you will be answering only 9 questions.
6. There are five boxes under each number. You will have a choice of four answers — A, B, C, D — for each question. Mark the first box under number 1 if your choice is answer A, the second box under number 1 if your choice is answer B, and so on. The fifth box will not be used.
7. The quiz on the next page is a brief summary of the **hm Math Study Skills Program.** Each question has more than one right answer. Choose the one answer which makes the most sense for *you* and mark it on the computer card.



1. When you listened actively, which skill did you find most helpful?

   A. Ask yourself questions about what the speaker is saying.

   B. Try to connect what the speaker is saying with what you already know.

   C. Try to listen "between the lines" for what the speaker is hinting at.

   D. When you can, "picture in your mind" what the speaker is saying.

2. Which resource have you found to be the most helpful when you need to learn the meaning of a mathematical term?

   A. Glossary

   B. Index and text

   C. Dictionary

   D. A friend

3. What is your favorite "musical phrase"?

   A. Least common denominator

   B. Greatest common factor

   C. Least common multiple

   D. None of the above

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4. In which source do you see more graphs?

   A. Your science textbook

   B. The daily newspaper

   C. Your social studies textbook

   D. Your math textbook

5. For how long do you usually work on your homework before you take a break?

   A. 20 minutes

   B. 40 minutes

   C. One hour

   D. Longer than an hour

6. Which kind of test questions do you find the most difficult?

   A. Multiple choice

   B. Matching

   C. 'Show your work' problems

   D. True/false

7. In which situation do you use mental arithmetic most often?

   A. In a store

   B. In math class

   C. At a ball game

   D. At home

8. At what time of day do you learn best?

   A. Morning

   B. Early afternoon

   C. Late afternoon

   D. Evening

9. What problem solving strategy do you use most often?

   A. Making a table

   B. Drawing a diagram

   C. Looking for patterns

   D. Solving a simpler problem

UNIT X SUMMARY: TAKING A MATH TEST

Learn to see a math test as a challenge, not a threat, by:

1. Planning your study and following your plan, so you'll be ready for the test and feel less threatened by it.
2. Setting a goal for the test. Be sure that your goal is realistic and challenging.
3. Understanding how math tests work. The more you know about how test questions are made, the more you'll know about how to answer them.

The kinds of questions used most often in math tests are:

1. Multiple choice	Read the question carefully. See if you can figure out the answer before you look at the choices. Then, read all of the choices and pick the best one. If you don't know which answer is right, cross out all of the ones which you know are wrong. Then, pick the best answer from the remaining choices.
2. Matching	Read the directions carefully. Use a process of elimination to match the items on the two lists. Do the ones you know first. Then, do the best you can with the items left.
3. True/false	Read the question carefully. If any part of the statement is false, it's a false statement. Watch for key words like always, only, all, never, often, usually, and none. Think about what these words mean in the statement.
4. 'Show your work' problems	Show all of your work. Organize your work on your paper as neatly as you can. Use a pencil so you can erase.

When you record your answers for a test on a computer card, you need to be very careful. Be sure that you mark only the boxes that you want to mark.